Edward B. Taylor, for the past twenty-one years employment manager of the Wickwire Spencer Steel Co., Palmer, Mass., has retired from service at the age of 80. The company operates drawing, pickling, brazing, welding, cleaning, galvanizing, tinning, steel cable or rope fabrication departments. The principal base metal used is steel.

Northrop Aircraft, Inc., 126th and Acacia Sts., Hawthorne, Calif., airplanes and parts, plans a new one-story plant on a 72-acre tract recently acquired near 120th St. and Crenshaw Blvd. Initial structure will total about 100,000 sq. ft. of floor space, for parts production and assembling. Cost over $175,000 with equipment. *B. G. Reed* is the company engineer in charge. The following departments are operated: rolling, spinning, stamping, soldering, brazing, welding, grinding, sand blasting, descaling, polishing, degreasing, cleaning, plating, tumbling, buffing, anodic treatment, lacquering, enameling and finishing. Principal base metals used: brass, steel, nickel, silver, zinc and lead.

E. V. Morrow, formerly treasurer of the Neveroil Bearing Co., Wakefield, Mass., has been appointed general manager, succeeding *R. H. Osborn*, who has resigned because of ill health. The above firm operates the following departments: brazing, grinding, polishing, tumbling and finishing; sintering and press.

Jelliffe Wire Works, Fairfield, Conn., wire goods, has let general contract for a second-story addition, 59 x 60 ft., to present one-story plant unit. Cost close to $40,000 with equipment. The firm operates the following departments: drawing, soldering, brazing, welding, plating, and heavy wire.

Rome Cable Corp., Ridge St., Rome, N. Y., electrical cable and wire has awarded general contract for a one-story addition for storage and distribution. Cost close to $50,000 with equipment. The following departments are operated: rolling, drawing and tinning; the principal base metal used is copper.

Mueller Brass Co., Port Huron, Mich., brass, copper and other metal products, plans two one-story additions, for expansion in tube mill department and for storage and distribution respectively. Cost over $100,000 with equipment. Departments: drawing, extruding, pickling, stamping, soldering, grinding, sand blasting, polishing, cleaning, plating, tumbling, burnishing, buffing, coloring, finishing and tinning. Principal base metals used: brass, bronze, zinc and lead.

Talon, Inc., Arch St., Meadville, Pa., metal slide fasteners, has let general contract for a three-story addition, 50 x 76 ft. Cost close to $85,000 with equipment.

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SHOP PROBLEMS

Supply Prices, November 29, 1939

Anodes

Prices, except silver, are per lb. f.o.b., shipping point, based on purchases of 2,000 lbs. or more, and subject to changes due to fluctuating metal markets.

COPPER: Cast ..... 22⅜c. per lb.
Electrolytic, full size, 17⅜c.; cut to size 17⅜c. per lb.
Rolled oval, straight, 17⅜c.; curved .. 18⅜c. per lb.
BRASS: Cast ..... 20¼c. per lb.
ZINC: Cast ..... 11½c. per lb.

NICKEL: 90-92%, 16" and over ..... .45 per lb.
95-97%, 16" " " ..... .46 per lb.
99%+cast, 16" and over, 47c.; rolled, depolarized, 16" and over, 48c.
SILVER: Rolled silver anodes .999 fine were quoted from 49c. per Troy ounce upward, depending on quantity.

Chemicals

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone, C.P. l.c.l., drums	lb.	.08
Acid, Boric (boracic) granular, 99.5%, bbls.	lb.	.053-.059
Chromic, 99%, 100 lb. and 400 lb. drums	lb.	.16¾-.17¼
Hydrochloric (muriatic) Tech., 20°, carboys	lb.	.027
Hydrochloric, C.P., 20°, carboys	lb.	.08
Hydrofluoric, 30%, bbls.	lb.	.07-.08
Nitric, 36°, carboys	lb.	.06
Nitric, 42°, carboys	lb.	.075
Oleic (Red Oil), distilled, drums	lb.	.09-.10
Oxalic, bbls. l.c.l.	lb.	.12-.14
Stearic, double pressed, distilled, bags	lb.	.12½-.13½
single pressed, distilled, bags	lb.	.12-.13
triple pressed, distilled, bags	lb.	.15½-.16½
Sulphuric, 66°, carboys	lb.	.025
Alcohol, Amyl, (Fusel oil, ref'd), l.c.l., drums	lb.	.175
Butyl-normal, l.c.l., drums	lb.	.095
Denat., S.D. #1, 190 pf., 1-18 drms, wks.	gal.	.325
Diacetone, pure, drums, l.c.l.	lb.	.095
Methyl, (Methanol), 95%, drums, l.c.l.	gal.	.385-.405
Propyl-Iso, 99%, l.c.l., drums	gal.	.41
Propyl-Normal, drums	gal.	.70
Alum, ammonia, granular, bbls., works	lb.	.0315
Potash, granular, bbls., works	lb.	.034-.037
Ammonia, aqua, 26°, drums, carboys	lb.	.02¼-.05¼
Ammonium, chloride (sal-ammoniac), white, granular, bbls.	lb.	.05-.075
Sulphate, tech., bbls.	lb.	.035-.05
Sulphocyanide (thiocyanate), pure, crystal, kegs	lb.	.55-.58
Sulphocyanide (thiocyanate), com'l, drums	lb.	.16
Antimony Chloride (butter of antimony), sol., carboys	lb.	.19½
Barium Carbonate, ppted., l.c.l., bags, works	lb.	.03
Benzene (Benzol), pure, drums, works	gal.	.21
Butyl Lactate, drums	lb.	.225
Cadmium Oxide, l.c.l., bbls	lb.	.80
Calcium Carbonate (Ppted. chalk), U.S.P.	lb.	.05¾-.075
Carbon Bisulfide, l.c.l., 55 gal. drums	lb.	.05¾-.06
Carbon Tetrachloride, l.c.l., drums	gal.	.73
Chrome, green, commercial, bbls.	lb.	.22
Chromic Sulphate, drums	lb.	.26¼
Cobalt Sulphate, drums	lb.	.65
*Copper, Acetate (verdigris), bbls.	lb.	.25
Carbonate, 53/55%, bbls.	lb.	.16
Cyanide, Tech., 100 lb. bbls.	lb.	.34
Sulphate, Tech., crystals, bbls.	lb.	.05
Cream of Tartar (potassium bitartrate), crystals, kegs	lb.	.26¼
Crocus Martis (iron oxide) red, tech., kegs	lb.	.07
Dibutyl Phthalate, l.c.l., drums	lb.	.195
Diethylene Glycol, l.c.l., drums, works	lb.	.155
Dextrine, yellow, kegs	lb.	.05-.08
Emery Flour (Turkish)	lb.	.07
Ethyl Acetate, 85%, l.c.l., drums	lb.	.075
Ethylene Glycol, l.c.l., drums, works	lb.	.17-.20
Flint, powdered	ton	30.00
Fluorspar No. 1 ground, 97-98%.	ton	$60.00
Fusel Oil, refined, drums	lb.	.125-.14
*Gold, Chloride	oz.	$18¼-23
Cyanide, potassium 41%	oz.	$15.45
Cyanide, sodium 46%	oz.	$17.10
Gum, Arabic, white, powder, bbls.	lb.	.125-.14
Sandarac, prime, bags	lb.	.50
Hydrogen Peroxide, 100 volume, carboys	lb.	.20
Iron Sulphate (Copperas), bbls.	lb.	.016
Lead, Acetate (Sugar of Lead), bbls.	lb.	.11-.13¾
Oxide (Litharge), bbls.	lb.	.125
Magnesium Sulphate (Epsom Salts), tech., bag	lb.	.018
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Mercuric Oxide, red, powder, drums	lb.	$2.66
Nickel, Carbonate, dry, bbls.	lb.	.36-.41
Chloride, bbls.	lb.	.18-.22
Salts, single, 425 lb. bbls.	lb.	.135-.145
Salts, double, 425 lb. bbls.	lb.	.135-.145
Paraffin	lb.	.05-.06
Perchlorethylene, drums	lb.	.08½
Phosphorus, red	lb.	.42
yellow	lb.	.55
Potash, Caustic, 88-92%, flake, drums, works	lb.	.07¼-.075
Potassium, Bichromate, crystals, casks	lb.	.09¼
Carbonate (potash) 98-100%, drums	lb.	.06¾
Cyanide, 94-96%, cases	lb.	scarce
Pumice, ground, bbls.	lb.	.03
Quartz, powdered	ton	$30.00
Quicksilver (Mercury) 76 lb. flasks	flask	$90.00
Rochelle Salts, crystals, bbls.	lb.	.21¼
Rosin, gum, bbls.	lb.	5.25-7.75
*Silver, Chloride, dry, 100 oz. lots	oz.	.32
Cyanide, 100 oz. lots	oz.	.33½
Nitrate, 100 oz. lots	oz.	.27
Sodium, Carbonate (soda ash), 58%, bbls.	lb.	.0235
Cyanide 96%, 100 lb. drums	lb.	.15
Hydroxide (caustic soda) 76%, flake	lb.	.0355
Hyposulphite, crystals, bbls.	lb.	.035-.065
Metasilicate, granular, bbls.	lb.	.0315
Nitrate, tech., bbls.	lb.	.029
Phosphate, tribasic, tech., bbls.	lb.	.027
Pyrophosphate, anhydrous, bbls., l.c.l.	lb.	.0580
Sesquisilicate, drums	lb.	.0405
*Stannate, drums	lb.	.36½-.38½
Sulphate (Glauber's Salts), crystals, bbls., works	lb.	.0135
Sulphocyanide, drums	lb.	.30-.35
Sulphur, Flowers, bbls., works	lb.	.037-.0410
*Tin Chloride, 100 lb. kegs	lb.	.41½
Toluene (Toluol), pure, drums, works	gal.	.27-.30
Trichlorethylene, drums	lb.	.08½
Tripoli, powdered	lb.	.03
Wax, Bees, white, bleached, slabs 500 lbs.	lb.	.40-.44
Bees, yellow, crude	lb.	.30-.32
Carnauba, refined, bags	lb.	.48-.52
Montan, bags	lb.	25-.27
Spermaceti, blocks	lb.	.26-.27
Whiting, Bolted	lb.	.025-.06
Xylene (Xylol), drums, works	gal.	.31-.32
Zinc, carbonate, bbls.	lb.	.15-.17
Cyanide, 100 lb. kegs	lb.	.33
Chloride, granular, drums	lb.	.06
Sulphate, crystals, bbls.	lb.	.04

*Subject to fluctuations in metal prices.

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SUPPLEMENT OF METAL INDUSTRY

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CONTENTS

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DEPARTMENTS

Organic Finishing Comes of Age

There has been a recent interest in organic finishing and particularly its technical aspects which is heartening to those who have tried so long to raise this phase of finishing to its deservedly important position. Manufacturers are investing in control equipment and testing apparatus to an unprecedented extent. Engineers whose abilities combine chemistry and mechanics are being sought for advisory and supervisory positions. Finally, there is a wealth of practical research being pursued, the results of which are being actively discussed in the literature and in open meetings.

This sudden attention may be partly explained in terms of customer demand for finishes of improved durability and appearance. A more important reason, however, is the spreading realization that the old finishing department with its hit-or-miss methods is inefficient and unreliable and that to keep pace with present day production requirements, technical evaluation and supervision are absolutely essential.

There can be no argument with the statement that the manufacture of lacquers, enamels, varnishes and other organic finishing materials has long since passed the rule of thumb stage, or that the design of modern ovens, spray guns, booths, etc., is based on empiricisms. Manufacturers of materials and equipment have been extremely successful in utilizing the scientific approach. To complete the picture it is only necessary that the same approach be used in the selection and application of finishes and this movement seems to be underway. It is our prediction that organic finishing will soon be a real chemical engineering process, exactly and efficiently controlled.

L. J. LANGDON, *Publisher* • THOMAS A. TRUMBOUR, *Business Manager* • DR. WALTER R. MEYER, *Editor*

Evaluation of Spray Operator Ability

By Willoughby G. Sheane

Chemical Engineer,
General Electric Co.

A means for rating spray operators is developed, based on labor and material utilization. The author shows how sprayers may be checked for productivity and remunerated according to their overall ability in taking full advantage of time, equipment and material.—Ed.

In determining exact finishing costs, it is necessary that a method for the complete analysis of sprayer ability be used. Ratings based on time studies alone leave much to be desired since no account is taken of the material used, or rather, of the material wasted. It is the purpose of this discussion to develop a true rating method, one showing the effect of various factors on productivity and indicating where labor and material savings may be made.

In general the productivity of a spray operator is dependent on two factors: first, that portion of finishing operation time actually spent in spraying, and second, that portion of finishing material used which is actually applied. These two factors may be called *Labor Utilization* and *Material Utilization* respectively. The ideal operator would spend *all* of his time in spraying (complete labor utilization) and would apply *all* the material delivered by his gun with no losses (complete material utilization). If a sprayer triggers his gun, or stops frequently to inspect his work, or loads and unloads slowly, the amount of time given to spraying is small and his production will be proportionally low. Further, if an operator embraces a technique which allows large material losses, his production will be low for the obvious reason that the wasted material represents unproductive spraying effort.

Labor Utilization Factor

Let us assume a sprayer whose material utilization is 100%. Inasmuch as there is no time lost in spraying unproductive material the operator's productivity will be a function of his labor utilization only. This labor

Willoughby G. Sheane

utilization may be expressed as follows:

$$Lu = \frac{Va}{Vp} \qquad \text{Eq. (1)}$$

where:

Lu = labor utilization factor
Va = actual volume of material sprayed per time unit—gallons
Vp = possible volume of material sprayed per time unit in gallons

For example, an operator uses 0.6 gallons of material per hour (Va). However, the gun at the adjustment used has the capacity to deliver 1.0 gallons per hour (Vp). This indicates that during 40% of the hour the gun is closed and no work is being sprayed. The labor utilization factor, therefore, is $Lu = \frac{0.6}{1.0} = 0.60$. Had the gun been open for the full hour this factor would have been unity and the production greater in the ratio of 10 to 6.

Material Utilization Factor

Now consider the reverse situation. Consider this operator as having a labor utilization of 100% but wasting part of the material he sprays as overspray, etc. In this case his productivity will be dependent entirely on the volume of material actually applied on the work in comparison with the volume sprayed. In other words, the work accomplished will be a function of the material utilization:

$$Mu = \frac{(A)\ (Tw)\ (N)}{(1.604)\ (Va)} \qquad \text{Eq. (2)}$$

where:

Mu = material utilization factor
A = area per piece in square feet
Tw = applied full wet film thickness in inches
N = number of pieces finished per time unit
1.604 = constant

Since (Tw) in Equation (2) can not be readily measured because of solvent losses, use is made of the relationship:[1]

$$Tw = Tc\frac{(833)\ (Dc)}{(Ps)\ (W)} \qquad \text{Eq. (3)}$$

[1]Metal Industry, **37**, No. 7, pp. 328-330, (1939)

and Equation (2) becomes: $Mu = \frac{(519)(A)(Tc)(Dc)(N)}{(Ps)(W)(Va)}$ (Eq. 4)

where:

519 = constant
Tc = cured film thickness in inches
Dc = density of cured film in grams per cubic centimeter
Ps = per cent by weight of non-volatiles in finishing material
W = weight per gallon of finishing material in pounds

For example, an operator uses 0.6 gallons of material (Va) in spraying 40 pieces per hour (N). The area per piece is 1.5 square feet (A) and the cured film thickness measures 0.00120 inches (Tc). The material weighs 6.5 pounds per gallon (W), contains 35.0% by weight of non-volatiles (Ps) and cures to a film whose density is 1.65 grams per cubic centimeter (Dc). The material utilization factor is, therefore: $Mu = \frac{(519)(1.5)(0.00120)(1.65)(40)}{(35.0)(6.5)(0.6)} =$ 0.45. Had there been no waste of material this factor would have been unity and the production greater in the ratio of 10 to 4.5.

Productivity Factor

From the previous discussion it will be seen that the overall productivity of a spray operator is a function of both his labor and material utilization. If this productivity be designated (P), then:

$$P = (Lu)(Mu) \quad \text{Eq. (5)}$$

or: $P = \frac{(Va)}{(Vp)} \cdot \frac{(519)(A)(Tc)(Dc)(N)}{(Ps)(W)(Va)}$ Eq. (6)

For example, taking the conditions described in the labor and material details above, the combination would show a productivity of P = (0.6) (0.45) = 0.27.

Discussion

Equation (6) shows the actual ability of a spray operator in comparison with his maximum capacity. Time studies taken to set piece rates may vary for a number of reasons but the productivity factor is a definite quantity and as such may be used as an absolute method of rating. Comparisons may be made between operators and between jobs with less chance for error and with more fairness to both employer and employee.

In addition, an examination of the labor and material factors will show where an operator is particularly efficient or not, as the case may be. If an operator shows one outstandingly high factor his example can be studied and applied to others to raise the general productivity. On the other hand a low factor will immediately indicate where stress must be laid to eliminate losses of time or finishing material.

Proper Hooding Increases Efficiency of Dust and Fume Collection

Case studies made by John G. Liskow, Chief Engineer of the Claude B. Schneible Company, Dust Compression Engineers, Chicago, have revealed the importance of having dust collector duct terminals properly hooded to provide efficient intake of dust and fumes.

Three types of operations were studied: foundry shakeouts, spray booths and heating furnaces, all under normal operating conditions.

Dust, soot and fumes arising from these operations were observed, their travel charted and a check made of accumulations that failed to enter the duct.

It was found that dust particles and fumes that did not come within a certain range of the intake duct were not removed from the plant atmosphere, but were left to settle around the operation. It was reasoned that, like a vacuum cleaner which only takes in particles coming in direct contact with the nozzle orifice, extending the intake over a greater area would bring the dust and fumes which had been evading the intake under control.

Experiments along this line were tried, several funnel-like types of intake hoods being developed for the purpose which proved a step in the right direction, but not quite suitable since some dust and fumes continued to evade the new extended type intake hood, unless large volumes of air were handled. It was found that three factors entered into proper operation of the new hoods:

(1) Natural drafts which were different in all three study cases and varied from season to season according to monitor and side wall window and door ventilation, and work temperatures:

(2) Some operations, such as in spraying where impact set up a reflex action, caused fumes to go to either side of the intake hood; and

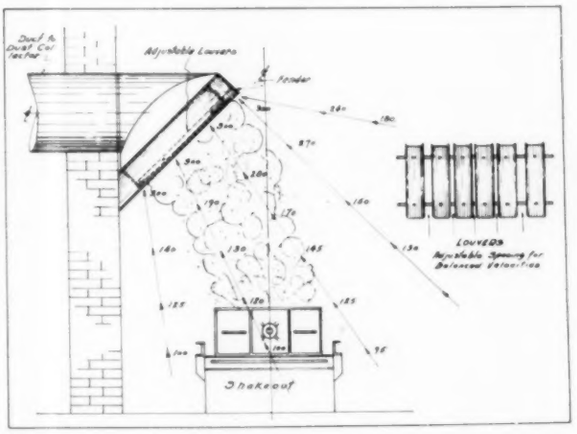
(3) The size of the work affected the flow of dust and fumes into the intake hood, bulkier objects causing them to be deflected to either side or above the hood opening.

With these things in mind, several types of hoods were developed which would envelop the entire equipment in a moving air stream and work as much as possible without interfering with loading or handling of work either by hand, overhead crane, conveyor or industrial truck.

The best location of the hood was found to be above and to one side of the operation with curtains on the sides and back to prevent as many eddy currents as possible from reaching the work. Exhaust ducts could be taken from the plenum back of the louvers either upwards, downwards or sideways, as would best suit the application with the design adopted.

To cope with the three factors mentioned above, a set of movable louvers were devised which can be adjusted to meet various conditions. Where dust and fumes have a tendency to go to right or left, the louvers can be moved toward the middle, closing off the plenum chamber at the center and pulling the dust in from the two sides.

Straight edged or sharp edged slats were originally used, but due to the high static loss, were early changed to the shaped louver now used on all installations as a power economy feature and to provide rigidity.



The sketch shows one of the several types of movable louvered intake hoods used in the experimental work and incidentally the finally adopted design, several of which have now been installed in industrial plants.

The Spectrophotometer for Controlling Color

By D. K. Donovan

Interchemical Corp.

The spectrophotometer is described and uses for its accurate control of colors are discussed. The spectrophotometer separates the component wave-lengths of light so that any color can be analyzed and standardized by the examination of the wave length-intensity curves obtained. The extent of reproduction of any color can be precisely evaluated.—Ed.

Introduction

Names of colors are rapidly becoming meaningless, as far as industry is concerned. "Red" signifies the color of sunsets, blood, roses, fire and rust. Eggs, linen, milk, cotton and teeth are all "white." But obviously, there are many gradations in shade and hue which distinguish the "red" of blood from the "red" of rust; the "white" of milk from the "white" of cotton, and so on. The science of color demands more accurate classifications than the ordinary general color terms. Dye, ink, paper, paint and other manufacturers, advertisers, artists and designers recognize the existence of the multitude of shades and differences in color and realize the need for more exact color specification.

Experts can distinguish minute color variations, when they have a standard of comparison. But their findings take considerable time, and while generally accurate, their judgment is not infallible. Then too, in this type of analysis, there is the difficulty of establishing a reliable standard—one that can be used as a true and unvarying basis of comparison.

The Spectrophotometer

A new instrument has been developed which removes the inconsistencies of human eyes from color measurement and reduces it to a mathematical, mechanical science. The first instrument of this type in commercial service, called the *recording spectrophotometer*, was installed at The Research Laboratories of Interchemical Corporation, where it is setting high standards in color analysis and matching. It was invented by Professor Arthur C. Hardy of the Massachusetts Institute of Technology. The machine at the Interchemical Corporation laboratories is the first one of this type in commercial service.

The recording photoelectric spectrophotometer charts in three minutes an analysis of any color, telling exactly how much of each wave-length of light is reflected by the sample. The human element does not enter into the workings of this machine for its action is entirely automatic. A color blind man with no technical training can operate it as successfully as a trained physicist with normal vision; intelligent interpretation of the curves produced, however, requires a highly specialized knowledge.

This instrument is being used at Interchemical principally for color matching and standardization, although developmental work now in progress is expected to widen its sphere of application. The machine provides a means of assuring absolute color matching. Two colors which look exactly alike under, say, incandescent light, might be shown by the "Specter" to have different characteristics. But if the charted wave-lengths obtained for two color samples in the spectrophotometer are the same, these colors will be identical under any kind of illumination—sunlight, north sky light, neon, sodium vapor, mercury arc, or any light source at all. There can be no argu-

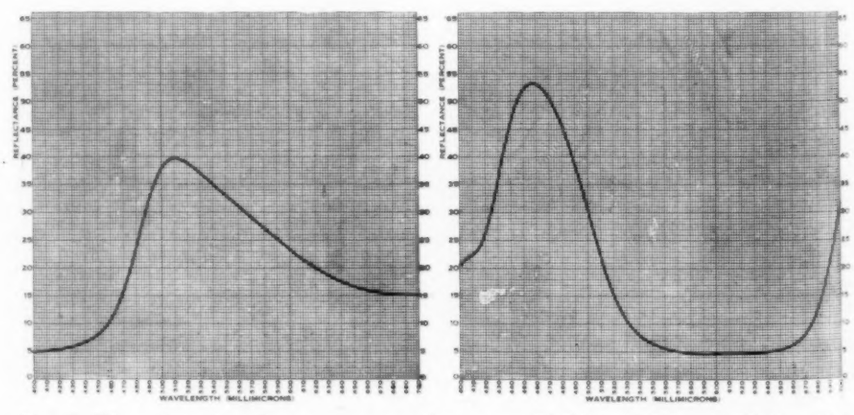


Fig. 1. Wave-length-reflectance curves for green (left) and blue (right). Note that the change from green to blue involves a shift towards shorter wave-lengths.

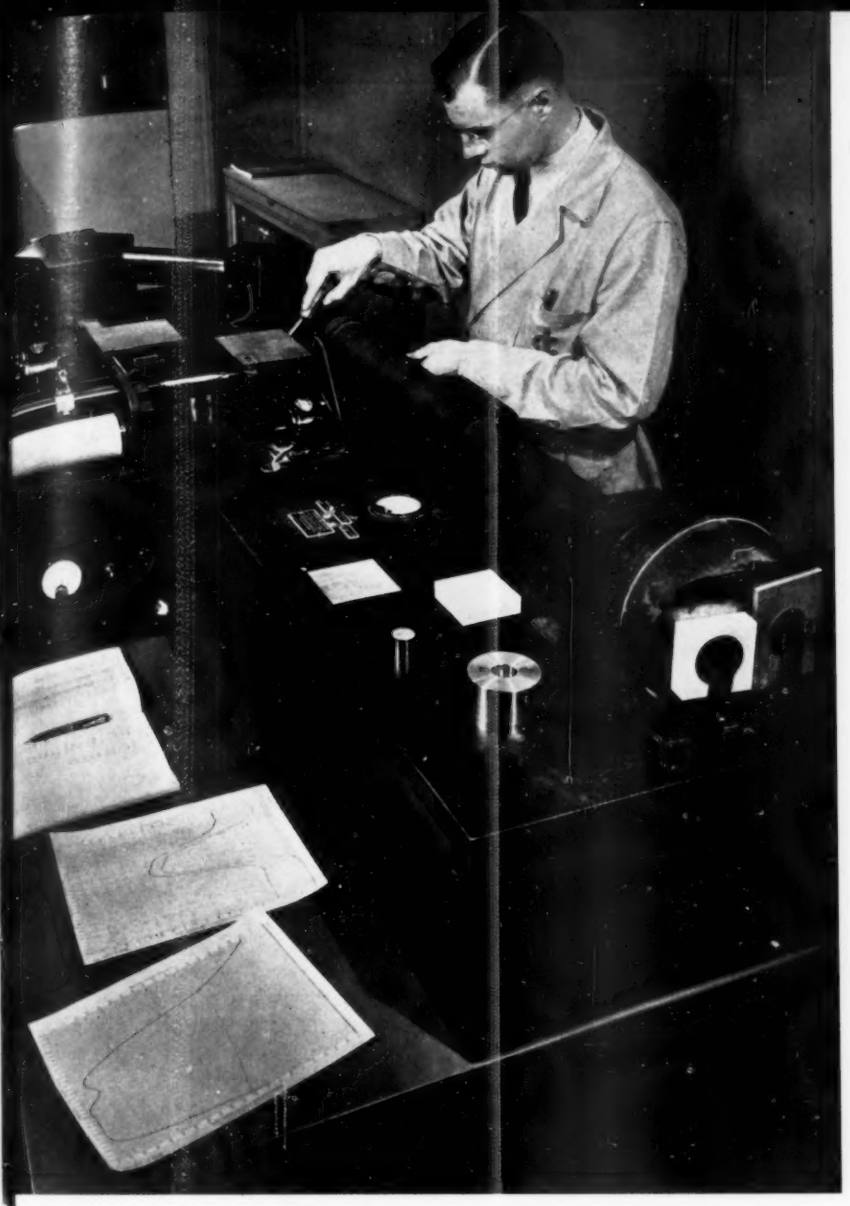


Fig. II. Operator adjusting spectrophotometer. Notice the wave-length-reflectance curves on the recorder and on the bench.

ment as to color match, if "Specter" curves coincide. Human vision and judgment are fallible, but the physicist's lens and photoelectric cell do not err.

Construction of Spectrophotometer

Before proceeding further, it might be well to discuss, without becoming technical, just how the "Specter" works. Compared with the intricate workings of the human eye, its mechanics are simple. In human vision, the millions of wave-lengths of light in the spectrum are accommodated and analyzed all at once as they strike the retina of the eye. The spectrophotometer admits and analyzes only one wave-length of light at a time.

This machine measures how much light is reflected by any colored material. To put it another way, it measures the difference in reflectance characteristics between the sample being tested and "pure white"—in other words, just what shade of color the sample is. Since there are many wave-lengths in the spectrum, it is important to measure the reflectance of the sample for every one.

The "Specter" is shaped like a "U." At one end, the sample to be tested and a "pure white" standard, usually magnesium oxide, are placed in neighboring positions in the walls of a sphere. The walls are coated with magnesium oxide also to assure maximum illumination within the sphere.

At the other end of the "U" is the light source—an ordinary tungsten filament lamp. Light from this lamp passes down a metal tube and through a prism which creates a spectrum. This light is directed through a small slit which moves from one end of the spectrum (the violet) through to the other end (the red). This moving beam of light, constantly changing in color, passes through another prism which diffracts it further so that it becomes essentially monochromatic.

The light beam then goes through the photometer system where it strikes the sample and the "pure white" standard alternately 60 times a second, due to the rotation of a polarizing element. As the light is changed, passing through the wave-lengths of the spectrum from violet to red, a photoelectric system automatically brings the photometer to balance for each successive kind of light. Through a mechanical arrangement, a revolving drum records a graph line connecting the balance points. Thus a graph, depending on the balance point for each wave-length of light, will be obtained for every color sample analyzed.

The "Specter" charts provide a universal and extremely accurate method of color measurement. Colors may be analyzed and matched, not by visual comparison, but by comparing charts.

These charts are ideal for filing. Actual color samples kept for record usually fade somewhat as they age, but charts, of course, provide an unchanging and permanent record of any color sample.

Uses of Spectrophotometer

How have these principles been put to practical use? Here are some examples. A national advertiser had difficulty in keeping the blue which identified his packages constant with each new printing. His printers could not always match exactly the shade of his sample, and as a result, the color of his packages varied occasionally. So a spectrophotometric curve was plotted and adopted as his color standard. Now inks to print his packages must closely approach this curve. The blue of his packages will always be the same—even under different types of illumination—and the standard will be preserved indefinitely, safe from the effects of fading or deterioration.

Incidentally, to make sure that they will remain unchanged and absolutely standardized, the school colors of the Massachusetts Institute of Technology have been charted by the "Specter."

Cornell University's color is carnelian—a difficult shade of red to define or specify. Many arguments have developed on just what the true shade of carnelian looks like. A piece of ribbon had been kept as the standard to settle controversies, but now this unusual color can be plotted spectrophotometrically. In future years, there will be no quarrels or disagreements about the proper shade of carnelian —and presumably the followers of the "Big Red" can bask in the assurance that Cornell's color has been indisputably established for all time.

Representatives of a national advertiser recently met with chemists from an ink company to decide what shade of blue should be used on the advertiser's packages. Not a color sample was in sight. The men studied graphs from the spectrophotometer. After an examination of the various curves, one was picked as representing the shade most suitable for the package. They had decided on the color without even looking at actual samples.

The exact colors of lacquers, enamels, paints and other organic finishes can be specified by their spectral reflectance curves. Any manufacturer who has a spectrophotometer can match a color without having a sample of it, by using only the information provided by its spectral reflectance curve. Color changes, due to aging or exposure to weather, can be precisely evaluated during progressive stages by the use of the spectrophotometric curves.

With color rapidly becoming a more important factor in organic finishing, advertising and merchandising, it is essential that a scientific approach to color be cultivated and developed. Despite the tremendous increase in the use of color, the science of color is just beginning to be understood. It stands today in a comparable position to astronomy when Galileo invented the telescope, or chemistry when Lavoisier first liberated oxygen from mercuric oxide.

The recording spectrophotometer provides a tool with which men can develop a scientific approach to color —an approach which will contribute immeasurably to the practical applications of color in industry.

The Organic Finishing of Dispensing Machines

By E. W. Jochim

Plant Engineer,
Mills Novelty Co.,
Chicago, Illinois

Dispensing machines must have finishes which withstand severe abuse and the author describes the application of the enamel finishes to the machines. Preparation and cleaning of the base metal are described as well as the equipment used. This equipment includes water-wash spray booths, a central dispensing system and modern ovens with conveyors.—Ed.

Coin-operated dispensing machines, usually located at points where many people congregate or pass, are subject many times to more or less exposure to weather conditions or to careless bumping or grazing by passersby. This equipment, therefore, must be sturdily constructed and have a finish that will retain its luster and favorable appearance over a long period of time.

The Mills Novelty Company, with three plants on Chicago's Northwest side, has long been manufacturing various types of coin-operated machines and has found that worth-while economies have been effected by equipping its three plants with modern machinery for fabricating and finishing this type of product. Its plant No. 2 is devoted to the production of ice cream machines, finished in white; Coca Cola dispensers, finished in red, green, and white colors; milk machines, finished in red and white; and beer machines, finished in accordance with the customer's specifications.

Suppose we follow through the finishing operations of the ice cream machines in plant No. 2, which will give a good idea of the processes followed with all the other products. In the production department, we find that the machines are all made of auto body stock primes, and in giving our attention to the ice cream machines, we see that as the various parts come from the stamping and forming machines, they are examined for any dents and scratches, or other defects. If any are found, they must be smoothed out and corrected, since any imperfections will show up in the finished product.

Into the Finishing Department

After passing this inspection, the pieces are placed on racks preparatory to immersion into a degreaser of the vapor spray type (constructed with steam coil inside the tank) using one of the standard solvents of the chlorinated hydrocarbon group, and immersing the parts into the vapor only.

On coming from the degreaser, the parts are tack-ragged, then passed to the Bonderizing tank, from there to a hot water rinse, and finally to a chromic acid rinse. A ½-ton overhead electric crane is used for handling the loaded racks into and out of the degreaser and the other treatment tanks. The parts are now hung on hooks suspended from an overhead conveyor,—the small parts on consecutive hooks and the larger on alternate hooks or on two hooks—and thoroughly wiped before they pass to the first spray booth.

The Circuit—Conveyor, Spray Booths, and Drying Ovens

The conveyor is of the continuous type, traveling at a speed of approximately 1½ f.p.m., with drop forged steel ball-bearing trolleys spaced at 2 ft. centers. Each trolley is provided with a swivel hook so that the pieces may be easily turned while being coated in the spray booth. Traction wheels, equipped with roller bearings, facilitate the turning of the conveyor inside the ovens.

The conveyor being a single unit, passes through the loading zone, through the first spray booth where the work is given a primer coat, then through the first oven, on to the finish coat spray booth, through the second oven, and around to the unloading point and back to the starting point.

The spray booths are of the downdraft water-wash type, carrying off the fumes and overspray, each being 8 ft. wide, 10 ft. high, with an 8-ft. working depth—11 ft. 6″ overall depth—constructed with perforated ceiling which has a height of 9 ft. This perforated ceiling is for the purpose of distributing the supply of air within the booth. Each booth is equipped with an 80 G.P.M. circular pump driven by a 5-hp. motor for operating the water curtain.

The spray booths are constructed of heavy black sheet metal, spot welded to 2 x 2 x ⅛″ angle iron frame, and are spray coated with aluminum inside and out.

The water-wash chambers are constructed of Tuncan sheet metal, spot welded to 2 x 2 x ⅛″ angle iron frame. The sections are fitted together with gaskets and sealed with roof cement.

The operators in the spray booths use newly developed spray guns, with ⅜″ material hose and connections, and 5/16″ air hose with connections. Each air line is equipped with an oil and water extractor.

The spray booths are connected to a common exhaust duct, which in turn is connected to a blower unit having a capacity of 24,000 c.f.m., the blower being driven by a 10-hp. motor. The spray booth area is under pressure slightly greater than the outside room air, which tends to keep dust and other foreign matter outside the booth area. Ventilation is through overhead air ducts. Fresh air supply comes from a filter room equipped with removable type filters, with a blower unit rated at 28,000 c.f.m., driven by a 10-hp. motor. Air exhausts through the door openings leading to the spray booths as well as through the exhaust ducts. There is an air seal at the entrances and exits of the ovens as well as at the entrance and exit of each spray booth, as an added precaution against dust contamination from outside the spray booth area.

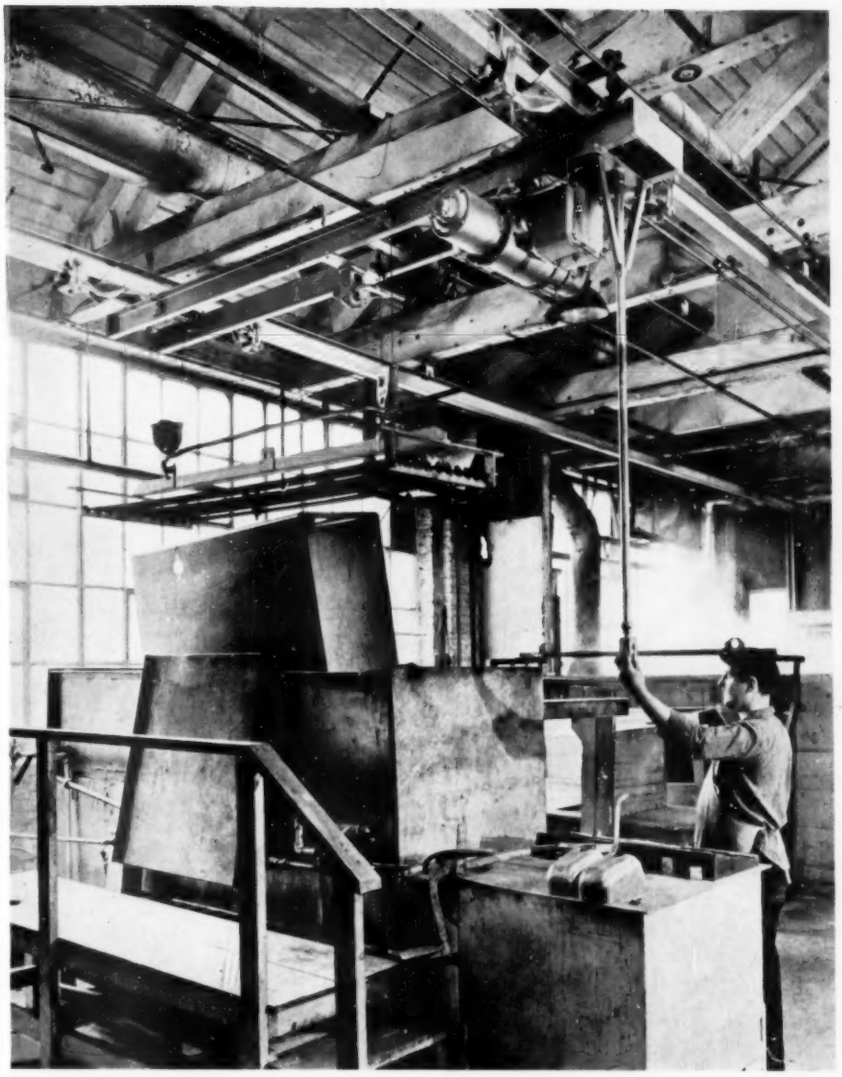


Fig. I. Traveling crane with rack on which pieces are suspended. By means of a push-button control, the pieces are dipped into the degreaser, Bonderizing and rinse tanks. (Courtesy Chicago Tramrail Co., Inc.).

The oven construction consists of ribbed panels inside and out, with 3″ of rock wool in wire mesh and 1″ air space for insulation. These ovens are headed by remote control, gas-fired heaters, using a large volume of re-circulating air and approximately 800 c.f.m. fresh air to each oven. The temperatures are maintained within very close limits by a series of controlling devices. The necessary safety appliances are included in the installation so that the entire equipment meets with fire insurance requirements. If, for instance, the exhaust fan fails to operate or the gas flame goes out, the gas supply is automatically shut off at once. Emergency CO_2 fire equipment is also located conveniently in the spray booth area. While the ovens are in operation, the temperature is recorded on charts which are filed for permanent record.

Spray Coating and Drying

As the sections of the ice cream machine suspended from the conveyor hooks travel through the first spray booth, they are given a coating of

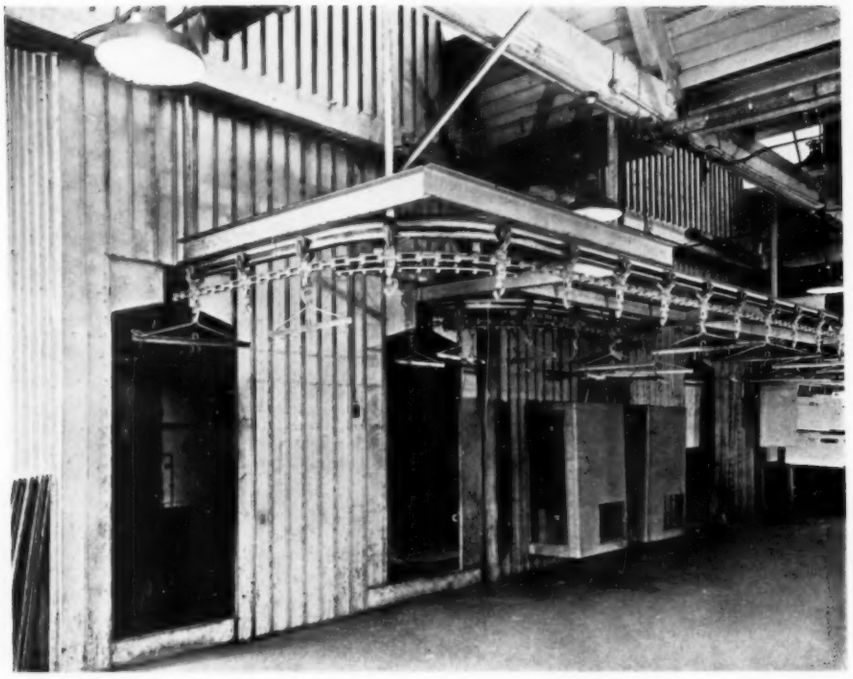


Figure 2. View outside of spray booth and oven enclosure, showing pieces suspended from overhead trolley conveyor ready to enter spray booths. (Courtesy Binks Manufacturing Company).

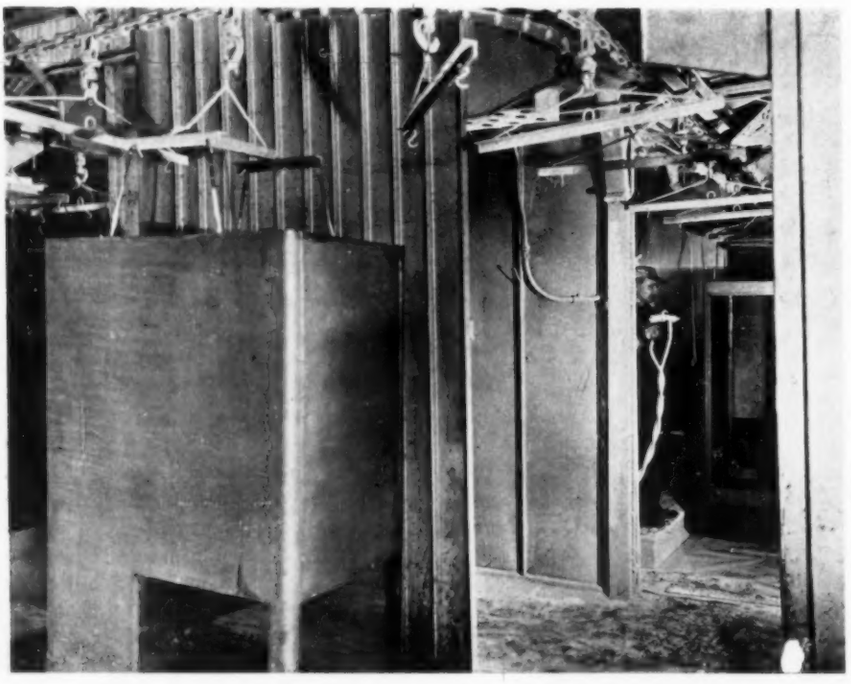


Figure 3. Looking through enclosure opening. Operator is seen ready to spray pieces as they pass along on conveyor. From here the pieces pass immediately into the drying oven.

white primer, reduced to a viscosity of 55 seconds in a No. 30 viscosity cup with hi-flash naphtha. Thereupon they continue on their way through the first oven, having a temperature of 340° F., the trip taking fifty-five minutes. Emerging from the first oven, they pass through a cooling section and are given a tack-ragging before passing into the second spray booth, where they are given a finish coat of white enamel, similarly reduced, using 2 parts hi-flash naphtha, 2 parts toluol, and 1 part pine oil. After that they continue their journey through the second oven, held at 275° F., where they spend approximately 1½ hours.

On coming from the second oven, the pieces are removed from the conveyor hooks, inspected, laid on special type of skid trucks, and wheeled to the assembly line. Just before crating for shipment, all machines are thoroughly cleaned and polished and given a final inspection.

The Paint Room

Paint is supplied to the spray booths through a piped system, pumps being used to circulate the paint. In the mixing room are 2 60-gal. galvanized tanks. Paint for a day's run is prepared in these tanks in the desired color to meet the production requirements for that day's run. Each tank is equipped with an agitator driven by an explosion-proof motor; also with a mechanical filter, one of the tanks having stainless steel parts, it being used for the white synthetic enamel. Each tank is also connected to a circulating pump driven by a 1-hp. explosion-proof motor, with V-belt drives. One of the pumps is of the rotary type, while the other is a cylinder triplex, glass lined pump for use with the primer. Each line is equipped with pressure regulators and gauges to provide equal pressure on all guns. The paint from the mixing tanks to the spray booths and back to the mixing tanks flows through 500 feet of ¾" galvanized pipe.

This installation of modern equipment has proved itself of value. It requires less space than would be required under the older method of manual handling and older methods of painting followed by air drying; and with it a higher quality of product is possible. There is also the added advantage that it is safer and also makes for better working conditions, to say nothing of lowered production costs.

The Mills Novelty Company is an organization which came into being about fifty years ago. The company is engaged in the manufacture of many kinds of coin-operated dispensing machines. Some ten years ago, they pioneered in the manufacture of small ice cream equipment, and since that time, the refrigerator end has grown to be an important part of the business.

Modern Developments in Blast Cleaning Methods

By Carleton Cleveland

The utilization and development of blast cleaning methods are described. The use of sand, steel grit and shot abrasives, the construction of nozzles, hoses and other pertinent data on blast cleaning equipment are discussed. The author also describes airless, centrifugal blast cleaning.—Ed.

Introduction

Sand blasting, like many other industrial operations, has recently grown to major proportions so that it now occupies an important niche in practically every large industrial plant. For preparing metal surfaces for finishing operations, sand blasting is one of the recognized methods for cleaning castings, forgings, and semi-finished fabricated metal products, also for removing scale, sand, and other extraneous matter from these surfaces, or for roughening surfaces preparatory to applying certain finishes or for artistic efforts. Sand blasting consists of the discharge of an abrasive material under force against surfaces to be cleaned or treated.

The origin of sand blasting is somewhat obscure. There is the old story about the action of the sands blown by the winds against the pyramids, having been observed by a party of engineers who put the idea to use by mechanically throwing a blast of air-driven sand against various hard surfaces for the purpose of cleaning or creating decorative effects. It was used for the ornamenting of marble, stone, and glass, and for the smoothing and cleaning of cast-iron hollow ware. Because the sand is fed to a jet of compressed air, it has sometimes been referred to as sand-jet. However, the more common term is that of sand blast.

While sand blasting has not been heralded far and wide, as have some other mechanical processes, the results attained in its particular field, when the simplicity of the means employed is considered, make it one of the most interesting of modern inventions. During the past decade the sand blast process has undergone considerable improvement, particularly in the specialization of units for handling certain classes of castings as well as for increasing the volume of production in a plant or industry. These improvements—both in equipment and the type of abrasives used—have done much to expand the use of sand blasting in the cleaning of metallic surfaces, such as castings, forgings, sheets, structural shapes, and so on, preparatory to painting, enameling, plating, galvanizing, rust-proofing, or other forms of finishing.

Blasting Not Confined to the Use of Sand

Until recently various kinds of sand were the only materials considered suitable for use in sand blasting operations. It has been found, however, that care must be exercised in the selection of sand,—that it must

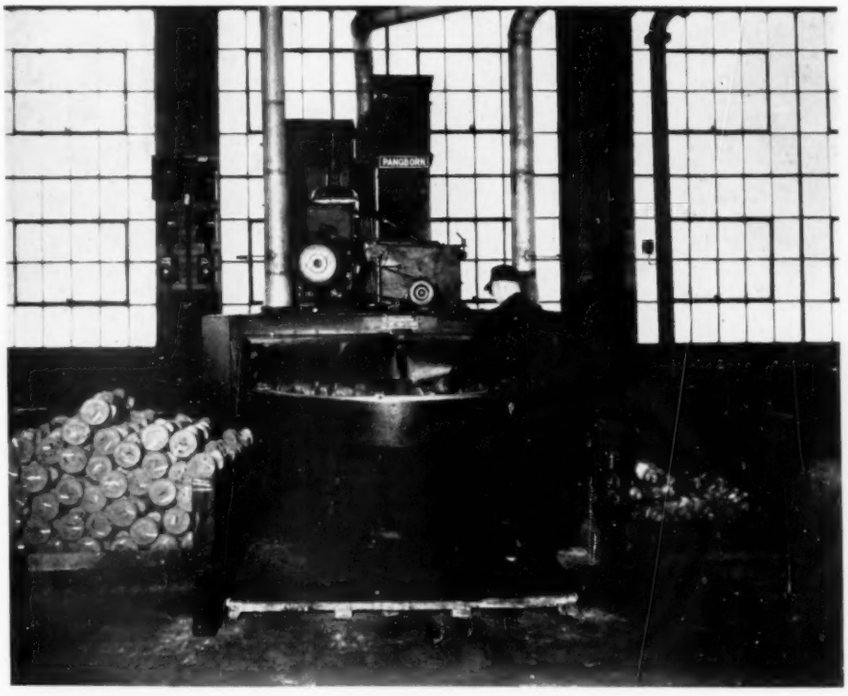


Figure 1. Table-type blast cleaning machine in a forge and stamping plant in Canada.

Figure 2. Heat-treated parts with heavy scale.

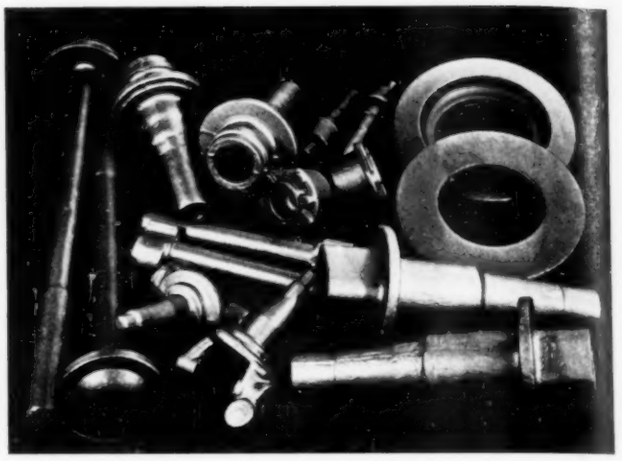


Figure 3. Parts from Figure 2 after they were cleaned by airless blast method.

be thoroughly clean and must have certain physical properties for each particular type of work that is to be performed. In one section of Illinois, there is a supply of St. Peter sandstone, which after being thoroughly washed, dried, and cleaned, and then screened to correct sizes, produces a very satisfactory abrasive of uniform flint-like particles without rough edges and without any tendency to chip or break. This material is hydraulically mined, and at no time is it subjected to crushing in order to reduce the size of the particles.

Other mineral abrasives are also used, but those of steel have been forging to the front. These too will produce a chemically clean surface. Steel abrasives, in England referred to as chilled iron shot, are divided into two types,—grit and shot.

Steel grit is angular in shape. The sharp points cut like numerous minute cutting tools, from which results a matted effect of any desired coarseness, according to the type and size of abrasive used. Precaution must, however, be taken on cast iron products (if they are to be subjected to further finishing operation) so as to eliminate the smudge which forms from the continued action of the steel abrasive upon the cast iron surface. This smudge is, in reality, composed of minute cast iron chips gouged out by the action of the steel abrasive. Each time, therefore, before that abrasive is re-used, it should be passed through a shaking screen of correct sized mesh. For this purpose, special equipment has been designed, as perfect screening is hardly possible by manual effort.

From the constant cutting out of the cast iron chips, the abrasive when used over and over again, may also become coated with a layer of smudge, and with the repeated impact of the blasting action these particles of smudge loosen and may be deposited upon the surface being cleaned and thus be pounded into the pores of the casting. This would, of course, cause imperfections in the enamel finish. To remedy this condition, some common sand may be periodically added (perhaps twice a week) which will take off the smudge coating by abrasion and absorption, and leave the steel grit clean and free from any adhering smudge.

Shot abrasive is exactly what its name implies,—smooth round pellets of uniform size, and is intended for work to be cleaned by shock, work-

Figure 4. Steel shot used for blasting.

Figure 5. Angular steel grit used for blasting.

Figure 6. Flint-like sand abrasive from Illinois sandstone.

ing like numerous hammers. It is used with satisfactory results on work the surface of which does not have to be suitable for enameling, galvanizing, or plating. Steel shot abrasive, as one manufacturer describe his product, is a cupola product made of a special mixture by a special process, hardened and tempered to relieve internal strains. The grit, this particular manufacturer points out, is made by crushing shot abrasive in ball mills that are loaded with large manganese steel balls which reduce the shot to sharp angular grit. Both grit and shot are carefully graded according to size. Any type of finish can be produced by selecting the proper size and type of abrasive. Light castings or fabricated products can be given a satin finish, and from heavy castings and forgings, the scale and other roughnesses can be blasted and made ready for finishing processes.

Steel abrasives eliminate to a large extent the dust problem, since steel of itself does not produce dust. Care, however, must be taken to store it in a dry place so that it will not be attacked by rust.

Principles on Which Equipment Is Built

Methods by which the sand blast process is carried on may be classified as:

INDUCTION system, in which the air nozzle is situated within the abrasive nozzle, thereby creating a suction that carries the sand with it;

DIRECT PRESSURE system, where the air and the abrasive are discharged together from a mixing tank held at line pressure;

CENTRIFUGAL FORCE system by which the abrasive is propelled against the surface or piece to be treated;

GRAVITY system, commonly employed in revolving drums and rotary tables.

Sand blasting equipment may be in the form of rooms or chambers; revolving barrels or drums; rotary tables; cabinets; and special equipment designed expressly for one particular purpose. Sand blast rooms may be built to meet any industrial requirement in size and design. Generally speaking such installation may consist of a blasting room or chamber; the blasting unit; an abrasive separator; a dust collector and fan; and the abrasive handling system. This latter unit—the abrasive handling system or abrasive recovery—has undergone some great changes in recent years.

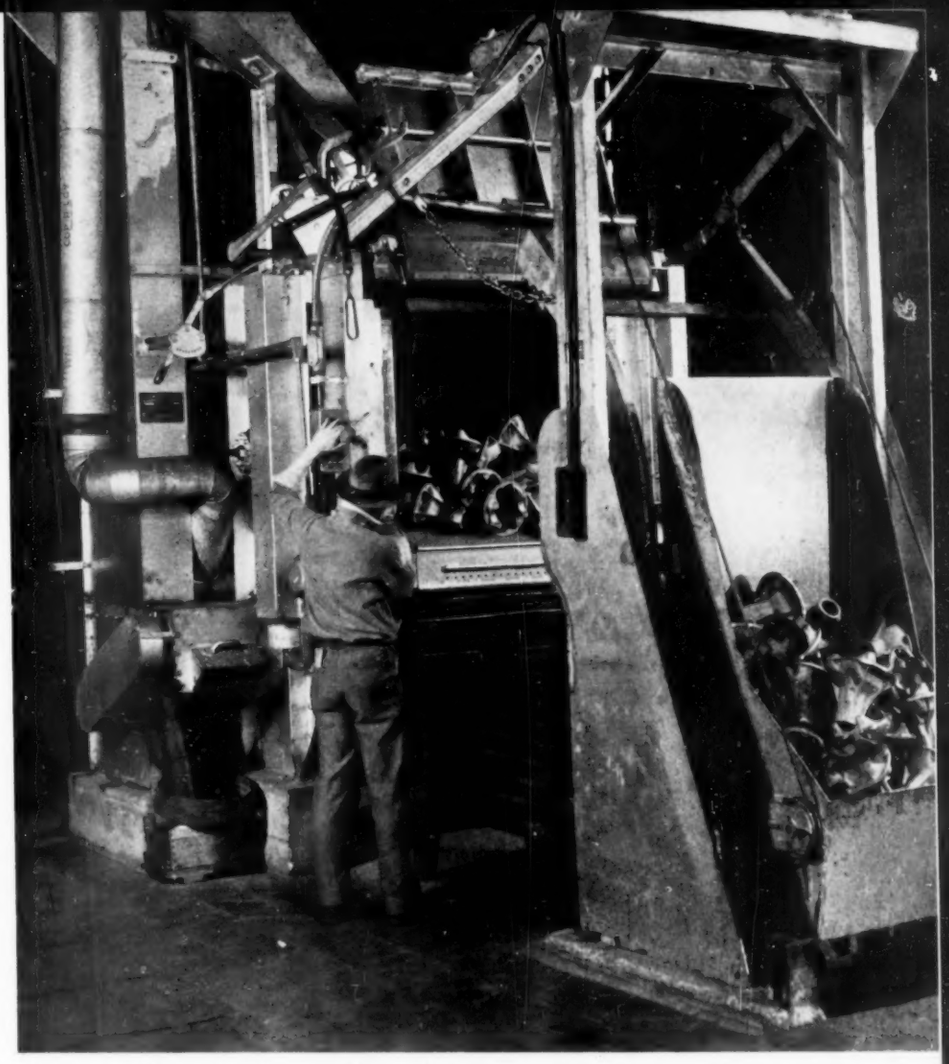


Figure 7. Blast cleaning machine utilizing centrifugal force. Parts ready to be discharged have been tumbled on apron conveyor and subjected to continuous stream of abrasive.

Modern Equipment Efficient and Dustless

Thirty years ago, a blast cleaning installation for large work was a crude affair indeed. No ventilation was provided; dust was intolerable; the blast machine not only lacked adequate abrasive flow control, but since there was no provision for abrasive recovery, the blast machine had to be filled and refilled by hand.

In the modern blast cleaning room, after striking the work at a predetermined velocity, the spent abrasive and refuse drop to a perforated floor of the chamber. This floor serves as a screen, retaining any wire, gaggers, or other larger pieces of refuse, while the finer material passes through the floor perforations to a steel hopper which feeds into a spiral or screw conveyor discharging into an elevator boot, where the material is picked up by a bucket elevator which travels upward, and discharges into an abrasive separator. Here the good abrasive is separated from the dust and fines and from other coarser material. The cleaned abrasive is returned to the blast machine, while the fine dust passes into a dust collector, and the coarse refuse is deposited into a container to await subsequent removal.

A clean abrasive, free from all foreign material, core or molding sand, scale dust, or other minute particles is important in all blast cleaning operations if production schedules and efficiency are to be maintained with operating costs kept at a minimum. The purpose of the modern separator is the removal of all coarse material from the used sand or steel abrasive, and the cleaning of the remainder to free it of dust and fine sand, metallic smudge, or scale.

Vastly different is the modern blast cleaning room from those of an

earlier, yet not so far distant, day. Despite all its earlier crudeness, the one thing that saved the blast cleaning process was the thoroughness with which it cleaned. With all its shortcomings, its hardships upon those early operators, no method yet devised had so thoroughly and easily cleaned all the surfaces and crevices, exterior and interior, without distortion or damage to desired sharp edges and profiles.

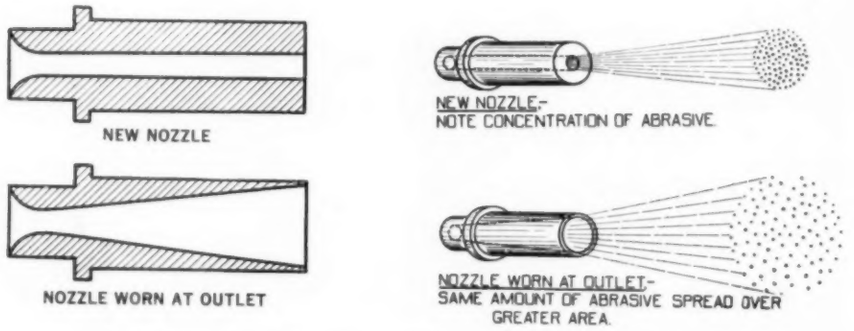


Figure 8. The effect of a worn nozzle outlet on the spread of abrasive.

Since the production capacity of a blast cleaning room is reduced by the interruptions incident to getting the heavy pieces of work into and out of the chamber, it was important that handling methods be designed to reduce stoppages to a minimum of duration. The character of the work to be cleaned, the size and weight of the pieces, together with the daily tonnage to be handled, are determining factors in the selection of the proper method to be employed in moving the work. Aside from the occasional demand for specially designed equipment, the modern blast cleaning rooms are furnished with car, turntable, monorail, or a combination of any of these to meet varied requirements.

Importance of Strongly Constructed Nozzle and Hose

Blast cleaning requires a hose and nozzle constructed to resist severe wear and tear caused by the speeding abrasive. Great improvement has been made in recent years in the nozzles used for this purpose. Formerly they were made of a white or chilled cast iron. The improved types are made of lead or aluminum surrounding a core of tungsten carbide or boron carbide. Somehow, the nozzle has not been granted the importance to which it is entitled, perhaps because of its simple construction. Most efficient blasting is accomplished when the abrasive stream is concentrated—when it comes through a uniform orifice in the nozzle. It can easily be seen that the continued flow of the abrasive causes a certain amount of wear, depending upon the type of abrasive and the material from which the nozzle is constructed. Nozzles are subject to two different kinds of wear—wear at the inlet and wear at the outlet. The wear at the outlet is greater than that at the other end. It begins at the nozzle tip and recedes backward, forming a bell-shaped outline within the interior of the nozzle. As the orifice increases in size, it spreads the abrasive stream, resulting in more or less unsatisfactory work.

Different types of work require different sizes and different pressures of abrasive spray. The size of the nozzle orifice to be used is dependent somewhat on the air supply. Compressors with insufficient capacity, limit the size of the nozzle orifice. The abrasive does the actual work of the sand blasting, and the volume of flow of both abrasive and compressed air is determined by the nozzle orifice. For efficient work, the flow of the abrasive must equal the carrying capacity of the compressed air. Nozzles come in a variety of sizes to suit the various types of work to be accomplished, as does also the hose.

Necessarily, the hose is also important, since restriction or expansion must be avoided in the abrasive line. Any restriction will interfere with the uniform flow of the abrasive through the line and cause fluctuations at the discharge end; or it may cause the nozzle to jam up. Expansion, on the other hand, may cause the compressed air and abrasive to increase in velocity, causing a spurt of sand blast action which may result in undue wear at some particular part.

The pressure used depends upon the nature of the work. While a pressure of from five to ten pounds may be found sufficient for the cleaning of light castings, from fifteen to twenty pounds are generally required for medium and heavy iron castings, to as much as thirty and seventy-five pounds for large steel castings.

The accompanying tabulation, reprinted by permission from Machinery's Handbook, Tenth Edition, published by the Industrial Press, New York, gives in concise form the amount of air required for nozzles of different diameter and different air pressures.

Cubic Feet of Free Air for Sand Blast Nozzles

Nozzle Diameter Inches	Air Gauge Pressures, Pounds per Square Inch					
	5	10	15	20	25	30
	Cubic Feet of Free Air per Minute					
¼	14.4	21.8	26.7	30.8	34.5	40.0
⅜	34.6	49.0	60.0	69.0	77.0	90.0
½	61.6	87.0	107.0	123.0	138.0	161.0
⅝	96.5	136.0	167.0	193.0	216.0	252.0
¾	133.0	196.0	240.0	277.0	310.0	362.0
⅞	189.0	267.0	326.0	378.0	422.0	493.0

Airless Blast Cleaning Equipment

Developments in blast cleaning equipment have also gone far in utilizing centrifugal force to throw a volume of abrasive at great speed against the work to be cleaned. This method eliminates compressed air, pressure tanks, hose, nozzles, piping, control valves, mixing chambers, and at the same time it represents a savings of the horse power necessary to generate air pressure.

(*Concluded in November issue*)

ORGANIC FINISHING DIGEST

PATENT AND LITERATURE REVIEWS

A frequent complaint—the emulsified paint chips off. Heinz Petschmann. Farben-Ztg. 44, 657-9 (1939). Inadequate adhesion with emulsified paints may be caused by (1) insufficient removal of previous coats of paint, calcimine or whitewash from the plaster, cement or other similar surface, (2) presence of a repellent coating on the surface to be painted, (3) defects in the plaster itself causing gradual breakdown on the paint or of the surface painted, (4) improper choice of pigments for the paint.

Finishing Room Control—L. W. Lamminan, Iron Age, July 20, 1939, p. 48. A practical discussion.

In modern industrial finishing, the materials entering, and the work carried on, in the finishing room, must be controlled for most efficient and uniform results. Materials control includes: (a) Viscosities (b) Mixing (c) Delivery. To be considered under work control are: Control of fluid pressure; control of air supply and pressures; control of film thickness; control of spray equipment, repairs; control of exhaust, replacement air, temperature and cleanliness. In the large plant, a set up for controlling these features, soon pays for itself; in the small plant such a fine degree of government may not be feasible but application of at least some of the principles may be highly advantageous.

Under each division of control, the author gives a series of recommendations. Thus under viscosity control, he advises every mixing room to have a means for determining viscosity, as for each fluid, a viscosity point exists which is the optimum value for the purpose at hand. In each section under consideration, practical information is given. A valuable pressure drop table of figures is included.

Color Helps—J. McQueeny, E. Podolsky. STEEL, July 3, 1939 p. 66 (Abstracted from the Rotarian). A generalized layman's discussion of the use of color in industry and industrial finishing. Psychological tests have shown that the colors most pleasing to men, in order of preference, are: Blue, red, violet, green, blue (tint), orange. Those most pleasing to women, in similar order: Red, blue, violet, violet (tint), violet (shade), blue (tint).

Spray Grille Floor Eliminates Booths—STEEL, July 24, 1939 p. 57. Metal lathes are now being painted and finished within a few feet of each other without the use of booths. The lathes run on a track over a 7 by 12 foot grating in the floor from which air is removed at the rate of 200 cubic feet per minute. The operator is never in danger from the fumes as the breathing zone is free of the paint mist because of the powerful down draft. The fume laden air is discharged into a welded steel tank where it meets a cascade of water which causes immediate precipitation of the solids content.

Drying with Near Infra-Red Radiation. L. S. Ickis, Jr., and H. Haynes. Gen. Elec. Rev. 43, 145-9 (Apr. 1939). The drying lamp with 10,000 to 20,000-hour life has a light output of about one-third that of a conventional Mazda filament lamp at comparable wattage, most of the energy being delivered in the invisible wave lengths. Near infra-red drying affords flexibility of plant construction and a saving of space. Heat control is positive, flexible, and requires no warming-up period. The radiant drying banks need be neither force ventilated nor insulated.

Patents

Process of Preparing Heat Resisting Enamels. U. S. No. 2,165,134. July 7, 1939. Granted to Karl Frank, Germany. Assigned to I.G. Farbenindustrie. A process of preparing enamels that are resistant to temperature variations by adding a pure silicic acid to the components of the said enamel, grinding and fusing with them.

Oil Soluble Resin. U. S. No. 2,167,094. July 25, 1939. Granted to V. H. Turkington and W. H. Butler. Assigned to the Bakelite Corp. of America. This is a reaction product of a methylene-containing substance and tar acids having a boiling point between 225° and 250° C., substantially free from phenols boiling outside of the said temperature range. It is a resinous substance solid at temperatures up to 80°C. and is soluble in fatty oils, independently of the presence of the components other than the said methylene-containing substance and the said tar acids.

Lacquer and Its Preparation. U. S. No. 2,167,127. July 25, 1939. Granted to F. Seebach, Germany. Assigned to the Bakelite Corp. of America. This consists of a process for making an aqueous dispersion of a phenol-aldehyde resin and wood oil suitable for use as a lacquer which comprises heating together about equal parts of wood oil with resin and a wood oil acid, in the presence of cyclohexanol, distilling off at least a part of the cyclohexanol and passing the product in the form of a heated liquid into water made alkaline with a suitable base.

Improving the Drying Properties of Oils. U. S. No. 2,167,206. July 25, 1939. Granted to T. S. Hodgins. Assigned to Reichhold Chemicals, Inc. A process for improving the drying properties of oils containing naturally occurring anti-oxidants. It comprises removing the anti-oxidants with organic oxidizing agents, such as benzoyl peroxide in proportions of about 1% by weight to the weight of oil used and keeping the pH at the proper point by the addition of 1-5% by weight of an acid or alkaline reagent and continuing the treatment until the refractive index of the oil begins to increase.

Casein Paint. U. S. No. 2,167,221. July 25, 1939. Granted to H. A. Scholz. Assigned to the U. S. Gypsum Corp. A casein paint comprising casein, borax glass, sodium fluoride, calcium hydroxide and a zinc sulphide pigment coated with a small amount of a salicyl compound from the group consisting of salicylic acid, salicylic acid salts, esters and amides.

Liquid Coating Composition. U. S. No. 2,167,573. July 25, 1939. Granted to C. Tobis, Germany. Assigned to General Electric Co. A baking enamel comprising a mixture of polymerized ester of acrylic acid and polymerized acrylonitrile, and an organic solvent for the said mixture, comprising a mixture of diethylene dioxide, monochlorbenzene, cyclohexanone, dichlordiethyl ether, and ethylene glycol diacetate.

Lacquers. German No. 671,949. Feb. 17, 1939. Granted to A. Nowack and A. G. R. Hessen. Lacquers containing the group phenyl hydroxide, CH_2O condensation products and filling and coloring materials are made by kneading the constituents in the absence of a solvent at high pressure and temperature at which volatile materials escape, and finally dissolving in a suitable solvent. An example is $PhOH\text{-}CH_2O$ ground with china clay and a dye in a ball mill at 120°.

Treating Waste Spray Particles of Synthetic Paint and Lacquer Materials, etc. By Laural J. Anderson (to Dearborn Chemical Co.) U. S. 2,161,122, June 6, 1939. The particle-laden air is brought into contact with a scrubbing water containing sufficient aluminum salt such as sodium aluminate and an alkali such as caustic soda sufficient only to produce a substantially insoluble metallic compound, whereby coalescence of the waste particles is prevented and coagulation is effected. Apparatus is described.

NEW EQUIPMENT AND SUPPLIES

LATEST COMMERCIAL DEVELOPMENTS IN ORGANIC FINISHING

Hammered-Effect Finish

A new marproof hammered-effect finish designed especially for use on rough or porous metals is announced this month by the *Ault & Wiborg Corporation,* New York. The new finish is said to cover defects in the metal, such as spot weld marks and file scratches, and while it has the effect of a rough finish, its surface is actually smooth.

Polymeroid is made with a Polymerin base, and hence retains the characteristics of heat resistance, durability, and adhesion which Polymerin is claimed to provide. Like Polymerin, it may be baked on a short schedule.

The heat resistance of Polymeroid is stated to make it well adapted for use on such products as boiler jackets, space heaters, water heater cabinets, and all types of heating appliances. Polymeroid's toughness and resistance make this finish suitable for vending machines, office equipment, furniture, air-conditioning units, and other uses where durability is an important consideration.

Although two operations are involved in its application, Polymeroid is essentially a one-coat finish. The first coat is applied with a spray gun, and while it is still wet, another coat, usually nothing but solvent, is sprayed on. This second coat causes the hammered appearance which gives the effect of a rough finish, thus hiding any metal defects which may be present. The uniformity of this hammered pattern can be closely controlled. Since the surface is actually smooth, although uneven in appearance, it will not attract dust as do some finishes used for similar applications. According to the manufacturer, Polymeroid has greater mileage than these other finishes. It is available in all colors, and it can be furnished with a high gloss.

New Quick-Bake Synthetic Enamels

A new line of "high speed" synthetic enamels, especially suitable for use on metal products subjected to severe service, such as washing machines, refrigerators, kitchen cabinets, etc., has been developed by *Maas & Waldstein Company,* makers of industrial finishes, Newark, N. J.

These new enamels, known as "Codur" enamels, are said to cut down the time needed for finishing and thus enable manufacturers to speed up production. They dry out of dust rapidly and bake in a few minutes to a fine finish that is exceedingly durable and resistant to marring, moisture, and the action of ordinary household chemicals. The baking schedule varies with the temperature, but at 325°F fifteen minutes is sufficient.

Codur enamels are furnished in all plain colors and also in colors with metallic lustres. They are claimed to cover well in one spray coat or can be used over a primer. Supplied in types suitable for use on all metals and many plastics, including Bakelite.

New Standard Automatic Type Spindle Finishing Machine

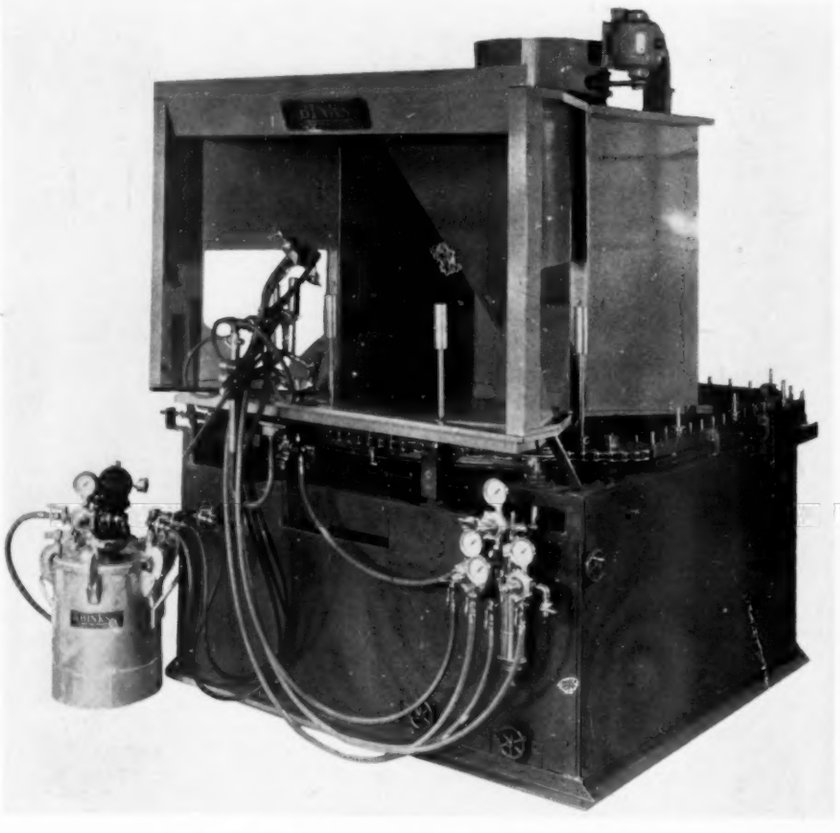
A new Standard Spindle Type Automatic Spraying Machine is being currently introduced by the *Binks Manufacturing Company,* 3114-40 Carroll Avenue, Chicago, Illinois.

According to *J. F. Roche,* president of the company, the new machine is so designed that it is readily adaptable to all types of automatic spray finishing for clocks, battery boxes, golf balls, insulators, lamp fixtures, and many other similar items.

The machine utilizes the newly perfected Binks Thor Model No. 21 Automatic Spray Gun connected with a 3-way valve that shuts the gun on and off. In this way the gun sprays only when it is following the revolving products to be finished.

This new automatic spindle finishing machine becomes a companion unit to the Binks Automatic Reciprocating Machine for the spray finishing of flat ware. Like the reciprocating machine, the new Spindle Type unit can be furnished with either a Dry or Water Wash Type Spray Booth.

Manufacturers interested in learning how this new Spindle Type Machine can be adapted to the high speed finishing of their own products can secure complete details and prices by writing direct to the Binks Manufacturing Company.



New standard automatic spindle type finishing machine.

Air Motored Mixer

With the introduction of the Type AB Pneumix air motored mixer, the *Eclipse Air Brush Company, Inc.*, 390 Park Avenue, Newark, N. J., has filled out its series of clamp-type direct drive agitators. The AB is a small mixer designed especially for use on 5-gallon batches. It has all the regular Pneumix features: variable speeds through air intake control (30-6000 RPM) and elimination of fire and explosion hazards through air motor operation.

These mixers are in use on the most flammable materials—varnish, lacquer, gasoline, high explosives, etc.—and the air throttle control of speed makes their use particularly important on jobs where the viscosity of the material changes during mixing.

Air-motored mixer for small batches of inflammable materials.

Type AB Pneumix is standard with a ⅜" chromium-plated or stainless steel shaft, 12" long, with one 3" triple blade chromium-plated bronze or stainless steel propeller. Longer shaft, different propeller and other metals are supplied to order.

Wood Finishing Lacquers

Hilo offers its latest development in wood finishing lacquers for wood furniture, case goods, etc.—a complete line of non-royalty lacquers, comprising sanding sealer, gloss and flat lacquers. Specially formulated to fit many of the standard finishing schedules now in use; for example, one coat of sealer and two coats of gloss clear for a high gloss finish; or a coat of sealer and a coat of flat for a full, flat finish. Write Hilo Varnish Corp., 42-60 Stewart Avenue, Brooklyn, N. Y., for full particulars about these wood finishing lacquers.

New Model Sander-Grinder

Porter-Cable Machine Co., Syracuse, N. Y., has announced the latest model "Take-About" sander-grinder, which is said to operate at a higher belt speed and to have more power. It is balanced four ways, easier to handle and to obtain a true finished surface, avoiding spoilage.

The dust collecting system of the new model BB-10 is more effective, according to the manufacturers, as it provides a double fan and ample power, and it is said to be practically dustless. Ventilation has been improved to obtain a cool operating unit.

New model sander-grinder.

The belt change is expedited by the new lever control, and correct tension on the belt at the new high speed is maintained automatically in this new model. A silent chain drive delivers more power to the point of work and provides a quiet running machine.

These grinders are used on a variety of materials: wood, metal, stone, glass, plastic materials, etc. for manufacturing, finishing, maintenance and repairing operations.

Abrasion-Resistant Enamel

Baer Bros., 438 West 37th St., New York City, announce a new enamel finish for use on concrete floors, Dadoes, fire doors, machinery, pipe lines, etc. This enamel finish can, it is claimed, be used on any interior surface subject to abrasion.

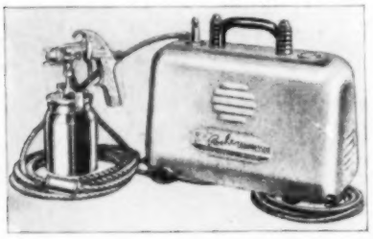
It is furnished in a rich, durable shade of battleship grey, and will give, according to the manufacturers, about 40% longer wear than most paints intended for this

purpose, and has a coverage of approximately 500 sq. ft. per gallon, drying overnight to a hard, glossy finish.

Baer Bros., are the sole manufacturers and distributors of Baertex floor and Dado enamel, battleship grey No. 11140.

Forced-Draft Cooled Portable Spraying Equipment

The Binks Manufacturing Co., 3114-40 Carroll Ave., Chicago, Ill., has developed a new portable spray unit, known as the "Roche" line, and designed the company reports, to correct the danger of overheating.



Forced-draft cooled portable spraying equipment.

Two powerful fans set up a suction and blowing system within the confines of an enclosed metal case. The scientific placement of intake and exhaust vents permits, it is claimed, the entrance of cooling air and does not allow this air to escape until it has passed completely around all parts of the unit, thus assuring a constant temperature.

The compressor is about the size of the average portable electric sewing machine, and roughly, the same general shape. The over-all weight is around 40 pounds and a single handle on the top of the unit permits handling as easily as one would carry a traveling bag. The case is of heavy-gauge steel, built to withstand rough usage.

Because the entire compressor unit is enclosed in a heavy metal case, the danger of accidents to workmen or the public, is said to be entirely eliminated. In addition to this, the unit itself is safeguarded and its life prolonged by this same protecting cover. Falling tools, a tipping ladder or a slipping scaffold, it is stated, can do no damage to this compressor. Powered with a General Electric motor this unit can be used in any location where either AC or DC current is available.

Manufacturers' Literature

Colors. The subject of color is said to be a difficult one on which to write because of so many stipulations being necessary before an explanation of the various phases can be properly presented. Roger K. Taylor, Ph.D., is the author of an article, in this catalog, which gives a brief description of colors and the procedure for their matching. The Porcelain Enamel & Mfg. Co., Baltimore, Md.

Controller. A bulletin describing controllers for applications where "open and shut" or two-position control is desired. Several pages are devoted to technical data on construction and operation, charts of temperature control, humidity control, liquid level control, and refrigeration control, from four typical "Rotax" control installations, are reproduced with explanatory captions. Also illustrated, in simplified form, are eight of the possible combinations of this control. Typical installation photos and data; tables of chart ranges; signaling accessories, etc., are included. The Foxboro Co., Foxboro, Mass.

Finish. "Polymerin"—a new finish for metal surfaces—is said to have the advantages of both lacquers and ordinary baking enamels with the limitations of neither. It is applied as a liquid; then it is baked on the metal, and is specially formulated, it is recorded, to utilize an intricate chemical action known as "polymerization." This finish comes in all colors. Ault & Wiborg Corp., a subsidiary of Interchemical Corp., 75 Varick St., New York City.

New Books

Industrial Solvents, by Ibert Mellan. Published by Reinhold Publishing Corp., New York. Size 6″ x 9″; 464 pages. Price $11.00.

A thorough, authoritative book on solvents and their industrial uses by Dr. Mellan, who has had many years of experience in the fields of synthetic resins, organic coatings and organic chemical synthesis.

The book is both theoretical and practical and makes extremely interesting reading inasmuch as it covers the theories of solvent action, evaporation rates, vapor pressures, boiling points and toxicity.

There are chapters on: Solution, Theories and Aggregates; Solvents, Latent Solvents, Non-Solvents; Plasticity; Vapor Pressure, Evaporation Rate, Boiling Point; Viscosity; Volatility, Inflammability, Toxicity; Solvents and Their Use in the Industries; Hydrocarbons and Their Hydrogenated Derivatives; Halogenated Hydrocarbons; Alcohols; Aldehydes; Acids; Ketones; Ethers; Esters, and Plasticizers.

The book is very accurately written and printed, with the information arranged in logical sequence.

The wealth of information on solvents should make this book of interest to all those engaged in organic coating formulation or use, to industrial chemists, research workers and anyone interested in organic solvents. The volume is supplemented by a chapter on graphical expression and interpretation with mathematical treatment.—W. R. M.

News of the Industry

Albert Miesem Elected Vice-President of Roxalin Flexible Lacquer Company

Albert Miesem joined the Roxalin Flexible Lacquer Company, Elizabeth, N. J., as a laboratory assistant twelve years ago, and after a thorough grounding in the technical and manufacturing end of the business, he was transferred to the sales department, representing the company in Northern New Jersey and the metropolitan area for several years.

Albert Miesem

With the growth and expansion of Roxalin, Mr. Miesem was brought into headquarters as sales manager, and has contributed much to the development of the field sales force, serving manufacturing accounts throughout the East and Middle West. He was recently elected to the office of vice-president in charge of sales.

Mr. Miesem is a native of New York City; is married and the proud father of two daughters and resides in Chatham Manor, N. J., where he is president of the Chatham Manor Improvement Association. His principal hobbies are skiing and cleaning the fish that his friends catch.

Finishing School

The *DeVilbiss Company* announces the schedule of their training school for the last three months of 1939.

This school is open to industrial painters, master painters, automobile refinishers and all others interested in learning the technique of spray-painting and the use and care of spray-painting equipment.

The training period lasts for one week. Classes will start on the following dates: October 9 and November 6.

Special rates in Toledo hotels and boarding-houses near the plant have been secured by the company for men attending the school.

Complete information may be obtained by writing The DeVilbiss Company, Toledo, Ohio.

Metal Prices, June 1, 1939

(All quotations are based on wholesale quantities, prompt delivery, New York unless otherwise specified.)

New Metals

ALUMINUM, Virgin ingot, 99% plus, c.l.	20.00c.
ANTIMONY, Chinese, 99%	14.00c.
BISMUTH, Ton lots, American, 99½%	$1.10
CADMIUM, Sticks and bars, tons	50c.
COPPER, Lake, delivered Conn.	10.00c.
Electrolytic, delivered Conn.	10.00c.
Castings, F.O.B. refinery	9.625c.
GOLD, U. S. Treasury price, oz. Troy	$35.00
LEAD, Desilvered and Prime Western	4.60c.
MAGNESIUM, 99.95% ingot	30.00c.
MERCURY (Quicksilver), Flasks, 75 lb.	$88.00
NICKEL, Ingot or Shot	36.00c.
Electrolytic, 99.95%, sheets	35.00c.
PLATINUM, oz., Troy	$35.00
TIN, Straits	49.00c.
ZINC, Prime Western	4.50c.
Brass Special	4.60c.
High Grade	5.50c.
Die Casting Alloy	7.50c.

Ingot Metals and Alloys

	Cents per lb.
No. 1 Yellow Brass	8.375
85-5-5-5	10.25
88-10-2	14.00
80-10-10	12.375
Manganese Bronze (60,000 t. s. min.)	10.375
Aluminum Bronze	14.625
Monel Metal Shot or Block	28
Nickel Silver (12% Ni)	12.375
Nickel Silver (15% Ni)	14.625
No. 12 Aluminum	13.00-15.00
Manganese Copper, Grade A (30%)	22-27
Phosphor Copper, 10%	15.00
Phosphor Copper 15%	15.50
Silicon Copper, 10%	21.50
Phosphor Tin, no guarantee	50-60
Iridium Platinum, 5% (Nominal)	$36.50
Iridium Platinum, 10% (Nominal)	$38.00

Old Metals

Dealers' buying prices, wholesale quantities:	Cents per lb.
Heavy copper and wire, mixed	7.00-7.125
Light copper	6.25-6.375
Heavy yellow brass	4.625-4.75
Light brass	3.625-3.75
No. 1 composition	6.25-6.375
No. 1 composition, turnings	6.00-6.125
Heavy soft lead	4.00-4.125
Old zinc	2.25-2.50
New zinc clips	3.00-3.25
Aluminum clips (new, soft)	13.00-14.00
Scrap aluminum, cast	6.50-6.75
Aluminum borings—turnings	4.50-4.75
No. 1 pewter	29.00-30.00
Electrotype	4.00-4.375
Nickel anodes	25.00-26.00
Nickel clips, new	27.00-28.00
Monel scrap	8.00-12.50

Wrought Metals and Alloys

The following are net BASE PRICES per lb., to which must be added extras for size, shape, quantity, packing, etc., or discounts, as shown in manufacturers' lists. Basic quantities on most rolled or drawn brass and bronze items below are from 2,000 to 5,000 lbs.; on nickel silver, from 1,000 to 2,000 lbs.

Copper Material

Sheet, hot rolled	18.12c.
Bare Wire, soft, less than carload	14.125c.
Seamless Tubing	18.62c.

Nickel Silver

Sheet Metal		Wire and Rod	
10% Nickel	25.25c.	10% Nickel	27.87c.
15% Nickel	26.62c.	15% Nickel	31.12c.
18% Nickel	27.62c.	18% Nickel	34.00c.

Aluminum Sheet and Coil

Base Prices Carload Lots (F.O.B. Mill)

Aluminum Sheet, 20 gauge	35.00c.
Aluminum Coils, 20 gauge	28.00c.

Rolled Nickel Sheet and Rod

Base Prices (F.O.B. Mill)

Cold Drawn Rods	50c.	Standard Cold Rolled Sheet	49c.
Hot Rolled Rods	45c.		

Monel Metal Sheet and Rod

Base Prices (F.O.B. Mill)

Hot Rolled Rods	35c.	No. 35 Sheets	37c.
Cold Drawn Rods	40c.	Std. Cold Rolled Sheets	39c.

Silver Sheet

Rolled Sterling Silver 45c. per Troy oz. upward according to quantity.

Brass and Bronze Material

	Yellow Brass	Red Brass 80%	Comm'l. Bronze
Sheet	16.48c.	17.25c.	18.25c.
Wire	16.73c.	17.50c.	18.50c.
Rod	11.85c.	17.50c.	18.50c.
Angles, channels, open seam tubing	24.98c.	25.75c.	26.75c.
Seamless tubing	19.23c.	19.90c.	20.65c.

Tobin Bronze and Muntz Metal

Tobin Bronze Rod	18.37c.
Muntz Metal Sheet	19.75c.
Muntz Metal Rod	15.87c.

Zinc and Lead Sheet

Zinc Sheet, carload lots standard sizes and gauges, at mill, less 7% discount	9.75c.
Zinc Sheet, 1200 lb. lots (jobbers' prices)	10.75c.
Zinc Sheet, 100 lb. lots (jobbers' prices)	14.75c.
Full Lead Sheet	7.75c.
Cut Lead Sheet	8.00c.

Block Tin, Pewter and Britannia Sheet

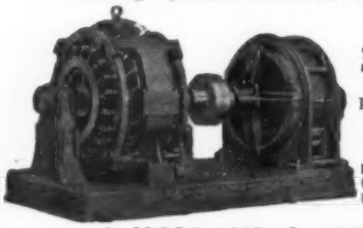
This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f.o.b. mill:

500 lbs. over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

Supply prices on page 306.

BUSINESS WANTS For Sale—Equipment and Supplies

REBUILT AND GUARANTEED
POLISHING AND PLATING EQUIPMENT
Plating Dynamos and Motor Generator Sets



All Sizes Carried in Stock

Tumbling and Plating Barrels and most anything for the Plating Shop.

Largest Stock of Rebuilt Polishing and Plating Equipment in America

Let us have your requirements. Entire plants or parts thereof bought for cash. Send us list with prices.

J. HOLLAND & SONS, INC.
274 South 9th Street, at Broadway, Brooklyn, N. Y.
EVergreen 7-3314—3315—3316

PLATING GENERATORS FOR SALE

1—M.G. Set, 2500 Amperes.
2—M.G. Sets, 1500 Amperes, 6 Volts.
4—Optimus M.G. Sets, 200 Amperes, 6 Volts (NEW).
2—Optimus M.G. Sets, 150 Amperes, 6 Volts (NEW).
3—M.G. Sets, 500 Amperes, 6 Volts.

All above, First Class Condition.

BEAM-KNODEL COMPANY
195 Lafayette St., N. Y. City

PLATING GENERATORS

600-300 Amp. 6-12 Volt $175.00
200 Amp. 6 Volt 87.50
Both above generators are connnected to 3 phase, A. C. Motors.
1200 Amp. 15 Volt Generator, only $375.00

ELECTRICAL SURPLUS COMPANY
1885 Milwaukee Ave., Chicago

FOR SALE

Slightly used loose, sewed and flannel buffs. Polishing and emery wheels at amazingly low prices.

LEWIS ROE MFG. CO.
1044-50 De Kalb Avenue
Brooklyn, N. Y.

Wanted—Equipment and Supplies.

WANTED

5000 Amp. used Generator for Electroplating, preferably 9-18 V. and Chandeysson or Electric Products make.

VACUUM CAN COMPANY
25 South Hoyne Avenue Chicago, Ill.

FOR RESULTS ADVERTISE IN

METAL INDUSTRY

ESTABLISHED 1909

BUYERS OF SCRAP
(ANY QUANTITY FROM 100 LBS. UP)

NICKEL ANODES—CADMIUM ANODES

Discarded Hooks—Racks—Baskets—Hangers—Nickel Strippings and Peelings—Drosses—Residues—Oxides—Sediments—Metallic Residues and By-Products—Monel—Nickel—Inconel—Stainless Steels. Guaranteed Immediate Cash Returns.

METALLURGICAL PRODUCTS COMPANY
CONVERTORS, RECLAIMERS AND MANUFACTURERS
35th & Moore Streets Philadelphia, Pa.

BUFFS WANTED— YOUR USED BUFFS ARE WORTH MONEY

Submit Samples

J. JACOBS, 8 East 41st St., New York
Room 802

SITUATIONS OPEN

WANTED

Platers with real experience in handling diversified line of hard chrome plating. State references and salary. Address "Industrial Chrome", care of Metal Industry.

NUGLU, the liquid cold glue, is used successfully in hundreds of plants. We have openings for salesmen or distributors selling NUGLU on a liberal commission basis.

J. J. SIEFEN CO.
Detroit, Mich.

LACQUER SALESMAN

SITUATION OPEN—Lacquer salesman experienced with following in Metropolitan New York, wanted by long established Eastern manufacturer. Our men know of this advertisement.

Address Lacquer Salesman, care of Metal Industry.

BUSINESS WANTS For Sale—Equipment, Etc.

SITUATIONS OPEN

SITUATION OPEN—Foreman Plater—for job shop with experience in hard chromium, nickel, cadmium, etc. Must be free to travel. Furnish references, and salary expected.

Address Travel, care of Metal Industry.

CLEANER SALESMAN

SITUATION OPEN—Cleaner salesman, man having had experience selling cleaning compounds to the finishing industry.
Cleaner Salesman, care of Metal Industry.

WANTED—SALESMAN

To handle a complete line of INDUSTRIAL FINISHES in Chicago and surrounding territory. Give full information, including experience and past connections. All replies will be considered confidential.

Address Industrial, care of Metal Industry.

SITUATIONS WANTED

FOREMAN PLATER

SITUATION WANTED—by a progressive foreman plater, who has had a broad experience in most all branches of Electro-plating. My experience covers still barrel, semi-automatic, or full automatic plating equipment, ball burnishing, wheel or barrel polishing, oxidizing, lacquering, and rust proof finishing on iron or steel. Will consider sales and service connection or foreman of plating department of a reliable manufacturer. I can make my own chemical analysis of plating solutions. Location unimportant if a steady position can be obtained. Salary secondary to opportunity—reference will be furnished at your request.

Address, Foreman Plater, care of Metal Industry.

PLATING FOREMAN

SITUATION WANTED—18 years' experience in silverware factory, 14 years as foreman, expert on all new finishes, make and analyze own solutions, 39 years of age, married. Will go anywhere and guarantee results.

Address Results, care of Metal Industry.

EXPERT PLATER

SITUATION WANTED by expert plater with 29 years of practical and theoretical experience with all now known plating solutions and finishes on all kinds of metal. Executive ability. High grade references.

Experience, care of Metal Industry.

SITUATION WANTED—Chemist-Plater—experienced all phases, both production and technical of electro-deposition on all types of metal from known plating solutions. Have had practical experiencce as foreman plater and chemist with responsible firms. Desire position as chemist, foreman plater, manager or sales or service representative.

Address Chemist-Plater, care of Metal Industry.

SITUATION WANTED—Polisher and Buffer—all branches, make wheels, instructor working foreman, production, go anywhere. References.

John Smith, care of Metal Industry.

FACTORY MANAGER OR SUPERINTENDENT

Practical management and engineering background with broad diversified manufacturing experience. Thorough knowledge of modern production methods; materials; equipment; costs; plant upkeep; organization, and labor relations.

Address Executive, care of Metal Industry.

SITUATION WANTED—Foreman plater, also polishing room experience in small or large shop. Understand all solutions and can obtain production. Have specialized in hard and bright chrome, can make and control all solutions by analyses. Location preferable in Middle West or West. Best of references furnished. Moderate salary.

Address Practical Plater, Box. 13, care of Metal Industry.

MANUFACTURING & FINISHING SUPERVISOR

With many years training and practical experience in the manufacture and finishing of large and varied lines of products.

Can specify all equipment, set it up, put it into operation, make and control solutions, develop methods for manufacture and finishing, train and handle help, supervise production, take full responsibility and charge, including costs of both labor and material.

Full details, both personal and business references gladly furnished at your request. Position with moderate salary, in any location desired where results will assure steady work.

Address C/F, Metal Industry.

Do you need more distribution in Wisconsin?

Experienced Salesman will leave present connection to affiliate with a few high class manufacturers on straight commission basis. Only those where possibilities of substantial profit will be considered.

Address Wisconsin, care of Metal Industry.

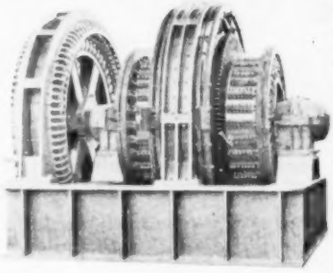
PLATER

SITUATION WANTED—by a plater with 20 years of practical experience with all plating solutions and finishes on all kinds of metal. Have experience in manufacturing and jobbing shops, wish position in city only.

City, care of Metal Industry.

BUSINESS WANTS For Sale—Equipment, Etc.

REBUILT AND GUARANTEED
Polishing and Plating Equipment



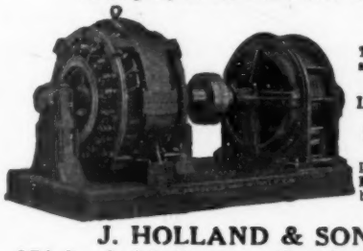
Largest and most complete stock of plating generator sets in America, too numerous to list, 100 amperes to 7500 amperes, 6/12 volts. Rheostats, Tumbling, Burnishing and Mechanical Plating Barrels.

Polishing & Buffing Lathes—Belt Drive, Motor Drive and Multi "V" Belt Drive.
Blowers, all sizes, belt and motor driven.
We carry a complete line of plating and polishing equipment and supplies.
Whatever your requirements may be in the plating and polishing line—call us for prices before placing your order.

WRITE — PHONE — WIRE

CLINTON SUPPLY CO.
112 So. Clinton Street Chicago, Illinois
Phone, Franklin 3538-3539

REBUILT AND GUARANTEED
POLISHING AND PLATING EQUIPMENT
Plating Dynamos and Motor Generator Sets



All Sizes Carried in Stock

Tumbling and Plating Barrels and most anything for the Plating Shop.

Largest Stock of Rebuilt Polishing and Plating Equipment in America

Let us have your requirements. Entire plants or parts thereof bought for cash. Send us list with prices.

J. HOLLAND & SONS, INC.
274 South 9th Street, at Broadway, Brooklyn, N. Y.
EVergreen 7-3314—3315—3316

PLATING GENERATORS FOR SALE

1—H. & V.W. 2500 Ampere M.G. Set
3—500 Ampere M.G. Sets
1—1500 Ampere M.G. Set
4—New Optimus M.G. Sets, 200 Amperes, 6 Volts
1—New Optimus M.G. Set, 150 Amperes, 6 Volts

All above, First Class Condition.

BEAM-KNODEL COMPANY
195 Lafayette St., N. Y. City

FOR SALE

2—4000/2000 Ampere, 17/34 Volt, CHANDEYSSON ELECTRIC CO. Motor Generator Sets; (SYNCHRONOUS DRIVEN)—factory-built-throughout, late design, condition like new, complete with full controlling equipment. Both units identical.
1—4000/2000 Ampere, 6/12 Volt, CHAS. J. BOGUE ELECTRIC CO. Motor-Generator Set, excellent condition throughout and complete with panel-board arrangement.
1—2500/1250 Ampere, 6/12 Volt, CHAS. J. BOGUE ELECTRIC CO. Motor Generator Set, excellent condition, complete with full controlling equipment.
1—2000/1000 Ampere, 6/12 Volt, CONNECTICUT DYNAMO & MOTOR CO. (Improved American Giant) INTERPOLE TYPE, Motor Generator Set, very late design, complete with full controlling euipment, like new.
1—1000 Ampere, 12 Volt, HANSON & VAN WINKLE CO. INTERPOLE TYPE, Motor Generator Set, excellent condition, with panel board.
1—1000/500 Ampere, 6/12 Volt, ELECTRIC PRODUCTS CO. Motor Generator Set, (SYNCHRONOUS DRIVEN)—factory-built-throughout, latest design, condition like new, complete with full controlling equipment.
2—750/375 Ampere, 6/12 Volt, HANSON & VAN WINKLE CO. Belt Driven Generators, excellent condition, with Panel Boards.
1—500 Ampere, 6 Volt, HANSON-VAN WINKLE-MUNNING CO. (INTERPOLE TYPE) Motor Generator Set, factory-built-throughout, like new, with full controlling equipment.
2—500/250 Ampere, 6/12 Volt, OPTIMUS-TYPE, Motor Generator Sets, with full controlling equipment, excellent condition throughout.
30—Electro-Plating Tank Rheostats, (Brand new)—with and without meters, various sizes.
1—BAIRD MACHINE CO. DOUBLE NO. 2 Size, Horizontal Type Ball Burnishing Barrel.
3—BAIRD MACHINE CO. DOUBLE NO. 1 Size Horizontal Type Ball Burnishing Barrels Units, excellent condition.
1—AUTOMATIC MACHINE CO. TYPE K-2 Motor Driven Buffing Machine, condition like new. (Buffalo, N. Y.)
1—PRODUCTION MACHINE CO. TYPE "A"—Centerless Feed Pipe Polishing Machine, belt type, Ball-Bearing Throughout.

MANY OTHER SIZES IN STOCK

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USED
RAG, CANVAS, SHEEPSKIN POLISHING WHEELS
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ABRASIVES (Also see Emery)
General Abrasive Co., Niagara Falls, N. Y.
Hamilton Emery & Corundum Co., Chester, Mass.
Harrison & Co., Haverhill, Mass.
Keystone Emery Mills, Phila., Pa.
Stevens, Inc., Frederic B., Detroit, Mich.
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

ACID PIPE
Belke Mfg. Co., Chicago, Ill.

ACID PROOF PIPE
Belke Mfg. Co., Chicago, Ill.
General Ceramics Co., Inc., New York

ACIDS
Boracic, Chromic, Hydrofluric
E. I. Du Pont de Nemours & Co., Inc., Electroplating Division, Wilmington, Del.
General Chemical Co., Philadelphia, Pa.
Harshaw Chemical Co., The, Cleveland, O.
Mutual Chemical Co. of America, New York, N. Y.

AGITATORS FOR PLATING SOLUTIONS Mechanical
Belke Mfg. Co., Chicago, Ill.

ALUMINUM CLEANER
Gumm Chemical Co., Inc., Frederic, Kearney, N. J.
International Chemical Co., Phila., Pa.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.

AMYL ACETATE
Egyptian Lacquer Mfg. Co., New York, N. Y.
Maas & Waldstein Co., Newark, N. J.
Zapon Company, Stamford, Connecticut.

ANODES
All Metals—Brass, Bronze, Cadmium, Copper, Lead, Nickel, Tin and Zinc
E. I. Du Pont de Nemours & Co., Inc., Electroplating Division, Wilmington, Del.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, O.
Lasalco, Inc., St. Louis, Mo.
McGean Chemical Co., The, Cleveland, Ohio
Munning & Munning, Newark, N. J.
Seymour Mfg. Co., Seymour, Conn.
Udylite Co., The, Detroit, Mich.
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.
Copper
Stevens, Inc., Frederic B., Detroit, Mich.
Nickel
Seymour Mfg. Co., Seymour, Conn.
Silver
Handy & Harman Co., New York
Seymour Mfg. Co., Seymour, Conn.

ANNEALING FURNACES
Electric Furnace Company, Salem, Ohio.

ANTI CORROSIVE FINISHES
Egyptian Lacquer Mfg. Co., New York, N. Y.
Maas & Waldstein Co., Newark, N. J.

AUTOMATIC METAL CLEANING MACHINES
Ransohoff, Inc., N., Cincinnati, O.

AUTOMATIC POLISHING MACHINES
Acme Mfg. Co., Detroit, Mich.
Hammond Machy. Builders, Kalamazoo, Mich.
Lupomatic Tumbling Machine Co., Inc., New York, N. Y.
Frederic B. Stevens, Inc., Detroit, Mich.

AUTOMATIC WIRE AND SHEET METAL WORKING MACHINERY
Baird Machine Co., The, Bridgeport, Conn.

BALL BURNISHING EQUIPMENT
Abbott Ball Co., The, Hartford, Conn.
Baird Machine Co., The, Bridgeport, Conn.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hartford Steel Ball Co., Hartford, Conn.
Lasalco, Inc., St. Louis, Mo.
Ransohoff, Inc., N., Cincinnati, O.
Udylite Co., The, Detroit, Mich.
U. S. Galvanizing & Plating Equip., Brooklyn, N. Y.

BALLS (Steel Burnishing, also Cones, Pins, Slugs)
Abbott Ball Co., Hartford, Conn.
Hartford Steel Ball Co., Hartford, Conn.

BASKETS, DIPPING
General Ceramics Co., New York
Hanson-Van Winkle-Munning Co., Matawan, N. J.
International Nickel Co., New York, N. Y.
Kirk & Blum Mfg. Co., Cincinnati, Ohio
Udylite Co., The, Detroit, Mich.
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

BILLET HEATING FURNACES
Electric Furnace Company, Salem, Ohio.

BLAST GATES — BLOWERS AND EXHAUSTERS — BLOWER SYSTEMS
Kirk & Blum Mfg. Co., Cincinnati, Ohio

BLOW PIPE SYSTEMS
Kirk & Blum Mfg. Co., Cincinnati, Ohio

BLOWERS AND BLOW PIPING (See also Fans.)
Astle, H. J., Co., Providence, R. I.
Kirk & Blum Mfg. Co., Cincinnati, Ohio

BOLTS, MONEL METAL
International Nickel Co., New York, N. Y.

BRASS FINISHERS' SOAP
Magnus Chemical Co., Garwood, N. J.

BRASS MILL PRODUCTS
Seymour Mfg. Co., Seymour, Conn.

BRASS; SHEET, WIRE, ROD, TUBE (Also see Rods and Bars, Sheets; Strip Metals; Wire, Etc.)
Bristol Brass Corp., The, Bristol, Conn.
Waterbury Rolling Mills, Inc., Waterbury, Conn.

BRIGHT-ANNEALING FURNACES
Electric Furnace Company, Salem, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

BRIGHT NICKEL FILTERS
Belke Mfg. Co., Chicago, Ill.

BRIGHT NICKEL SOLUTION
Hanson-Van Winkle-Munning Co., Matawan, N. J.

BRUSHES
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Co., The, Detroit, Mich.
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

GENERATOR
Morganite Brush Co., Long Island City, N. Y.
Speer Carbon Company, St. Marys, Pa.

BUFFING COMPOUND CLEANERS
Belke Mfg. Co., Chicago, Ill.
Gumm Chemical Co., Inc., Frederic, Kearney, N. J.
International Chemical Co., Phila., Pa.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York, N. Y.
Philadelphia Quartz Co., Philadelphia, Pa.

BUFFING AND POLISHING COMPOSITIONS
Advance Polishing Wheel Co., Inc., Chicago, Ill.
Beam-Knodel, Inc., New York
Belke Mfg. Co., Chicago, Ill.
Bias Buff & Wheel Co., Inc., The, Jersey City, N. J.
S. A. Day Mfg. Co., Buffalo, N. Y.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Lea Mfg. Co., The, Waterbury, Conn.
Chas. F. L'Hommedieu & Sons Co., Chicago, Ill.
Matchless Metal Polish Co., Chicago, Ill. and Glen Ridge, N. J.
Oriental Rouge Co., Bridgeport, Conn.
Plating Products Co., Newark, N. J.
Puritan Mfg. Co., Waterbury, Conn.
Frederic B. Stevens, Inc., Detroit, Mich.
Udylite Co., The, Detroit, Mich.
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N Y.

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Acme Mfg. Co., Detroit, Mich.
The Packer Machine Co., Meriden, Conn.
Frederic B. Stevens, Inc., Detroit, Mich.
Udylite Co., The, Detroit, Mich.
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

BUFFING MACHINES, AUTOMATIC (Also see Polishing Lathes and Heads.)
Acme Mfg. Co., Detroit, Mich.
The Packer Machine Co., Meriden, Conn.

BUFFING AND POLISHING WHEELS (Also See Buffs.)
Canvas, Cotton, Etc.
Advance Polishing Wheel Co., Inc., Chicago, Ill.
American Buff Corp., Chicago, Ill.
Bias Buff & Wheel Co., Inc., The, Jersey City, N. J.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Jackson Buff Corp., Long Island City, N. Y.
Lea Mfg. Co., The, Waterbury, Conn.
L'Hommedieu, Charles F. & Sons, Inc., Chicago, Ill.
Matchless Metal Polish Co., Chicago, Ill. and Glen Ridge, N. J.
Munning & Munning, Newark, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.
Yerges Mfg. Co., The Fremont, O.
Felt
Bias Buff & Wheel Co., Inc., The, Jersey City, N. J.
L'Hommedieu, Charles F. & Sons, Inc., Chicago, Ill.
Munning & Munning, Newark, N. J.
Yerges Mfg. Co., The Fremont, O.

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Jackson Buff Corp., Long Island City, N. Y.
Michigan Buff Co., Inc., Detroit, Mich.

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Advance Polishing Wheel Co., Inc., Chicago, Ill.
American Buff Corp., Chicago, Ill.
Bacon Felt Co., Winchester, Mass.
Bias Buff & Wheel Co., Inc., The, Jersey City N. J.
F. L. & J. C. Codman Co., Rockland, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J
Jackson Buff Corp., Long Island City, N. Y.
L'Hommedieu, Charles F. & Sons, Inc., Chicago, Ill.
MacFarland Mfg. Co., Inc., Long Island City, N. Y.
Matchless Metal Polish Co., Chicago, Ill. and Glen Ridge, N. J.
Munning & Munning, Newark, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.
Yerges Mfg. Co., The Fremont, O.

BUFFS, STAINLESS STEEL
Advance Polishing Wheel Co., Inc., Chicago, Ill.
Belke Mfg. Co., Chicago, Ill.
Bias Buff & Wheel Co., Inc., The, Jersey City N. J.
L'Hommedieu, Charles F. & Sons, Inc., Chicago, Ill.
Jackson Buff Corp., Long Island City, N. Y.
Matchless Metal Polish Co., Chicago, Ill. and Glen Ridge, N. J.
Yerges Mfg. Co., The Fremont, O.

BURNERS (Also see Furnaces.)
Air and Gas-Mixing
Campbell, Hausfeld Co., Harrison, Ohio

BURNISHING BALLS
Hartford Steel Ball Co., Hartford, Conn.

BURNISHING AND POLISHING BARRELS
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., The, Bridgeport, Conn.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hartford Steel Ball Co., Hartford, Conn.
Lupomatic Tumbling Machine Co., Inc., New York, N. Y.
Ransohoff, Inc., N., Cincinnati, O.
Stevens, Inc., Frederic B., Detroit, Mich.

BURNISHING COMPOUNDS AND CHIPS (also see Soap.)
Abbott Ball Co., Hartford, Conn.
Hartford Steel Ball Co., Hartford, Conn.
International Chemical Co., Phila., Pa.
Chas. F. L'Hommedieu & Sons Co., Chicago, Ill.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York, N. Y.

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Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, O.
McGean Chemical Co., The, Cleveland, Ohio
Udylite Co., The, Detroit, Mich.
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

CAGES, PICKLING, MONEL METAL
International Nickel Co., New York, N. Y.
Kirk & Blum Mfg. Co., Cincinnati, Ohio

CARBURIZING FURNACES
Electric Furnace Company, Salem, Ohio.

CAUSTIC SODA
Harshaw Chemical Co., The, Cleveland, O.
McGean Chemical Co., The, Cleveland, Ohio

CEMENT FOR POLISHING
Harrison & Co., Haverhill, Mass.
Siefen Co., J. J., Detroit, Mich.

CHAIN, MONEL METAL
International Nickel Co., New York, N. Y.

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E. I. Du Pont de Nemours & Co., Inc., Electroplating Division, Wilmington, Del.
Harshaw Chemical Co., The, Cleveland, O.
McGean Chemical Co., The, Cleveland, Ohio
Mutual Chemical Co. of America, New York, N. Y.

CHLORIDE
Nickel
Harshaw Chemical Co., The, Cleveland, O.
McGean Chemical Co., The, Cleveland, Ohio

CHROMIC ACID
E. I. Du Pont de Nemours & Co., R. & H. Chemicals Dept., Wilmington, Del.
Harshaw Chemical Co., The, Cleveland, O.
McGean Chemical Co., The, Cleveland, Ohio
Mutual Chemical Co. of America, New York, N. Y.

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United Chromium, Inc., New York

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Kirk & Blum Mfg. Co., Cincinnati, Ohio

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Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lasalco, Inc., St. Louis, Mo.
L'Hommedieu, Charles F. & Sons, Inc., Chicago, Ill.
Udylite Co., The, Detroit, Mich.
U. S. Galvanizing & Plating Equip., Brooklyn, N. Y.

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Munning & Munning, Newark, N. J.

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Kirk & Blum Mfg. Co., Cincinnati, Ohio

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Gumm Chemical Co., Inc., Frederic, Kearney, N. J.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
International Chemical Co., Phila., Pa.
Magnuson Products Corp., Brooklyn, N. Y.
Magnus Chemical Co., Garwood, N. J.
Munning & Munning, Newark, N. J.
Oakite Products, Inc., New York, N. Y.
Pennsylvania Salt Co., Phila., Pa.
Philadelphia Quartz Co., Philadelphia, Pa.
Sulphur Products Co., Greensburg, Pa.

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International Conveyor & Washer Corp., Detroit, Mich.

CLEANING COMPOUNDS (See also Fig Cleaner; Whale Oil Soaps.)
Metal
Ford, J. B., & Co., Wyandotte, Mich.
Gumm Chemical Co., Inc., Frederick, Corning, N. J.
International Chemical Co., Phila., Pa.
Magnuson Products Corp., Brooklyn, N. Y.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Pennsylvania Salt Co., Phila., Pa.
Philadelphia Quartz Co., Philadelphia, Pa.
Stevens, Inc., Frederic B., Detroit, Mich.

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Kocour Company, Chicago, Ill.

COMPOSITION APPLICATOR
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COMPOSITIONS (See Buffing and Polishing Compositions
Bias Buff & Wheel Co., Inc., The, Jersey City N. J.
S. A. Day Mfg. Co., Buffalo, N. Y.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Lasalco, Inc., St. Louis, Mo.
Lea Mfg. Co., The, Waterbury, Conn.
L'Hommedieu, Charles F. & Sons, Inc., Chicago, Ill.
Matchless Metal Polish Co., Chicago, Ill. and Glen Ridge, N. J.
Mc Aleer Mfg. Co., Detroit, Mich.
Munning & Munning, Newark, N. J.
Oriental Rouge Co., Bridgeport, Conn.
Puritan Mfg. Co., Waterbury, Conn.
Stevens, Inc., Frederic B., Detroit, Mich.

COMPOUNDS, CUTTING, GRINDING, DRAWING, STAMPING, STRIPPING
Gumm Chemical Co., Inc., Frederic, Kearney, N. J.
International Chemical Co., Phila., Pa.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York, N. Y.
Philadelphia Quartz Co., Philadelphia, Pa.

COPPER BRAZING FURNACES
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COPPER CYANIDE
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COPPER SULPHATE
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CORE OIL AND COMPOUNDS
Stevens, Inc., Frederic B., Detroit, Mich.

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CRUCIBLES, METAL MELTING
- Stevens, Inc., Frederic B., Detroit, Mich.

CUTTING, STRAIGHTENING, FORMING & EXTRUDING MACHINERY
- Baird Machine Co., The, Bridgeport, Conn.

CYANIDE OF SODIUM
- E. I. Du Pont de Nemours & Co., Inc., Electroplating Division, Wilmington, Del.

CYANIDES
- E. I. Du Pont de Nemours & Co., Inc., Electroplating Division, Wilmington, Del.
- McGean Chemical Co., The, Cleveland, Ohio

DIPPING BASKETS
- Dipping and Plating
- International Nickel Co., New York, N. Y.
- Kirk & Blum Mfg. Co., Cincinnati, Ohio
- Lasalco, Inc., St. Louis, Mo.

DRAWING FURNACES
- Electric Furnace Company, Salem, Ohio.

DRYERS
- Dellinger Mfg. Co., Lancaster, Pa.
- Kirk & Blum Mfg. Co., Cincinnati, Ohio

DRYERS, ENAMELING AND JAPANNING
- Kirk & Blum Mfg. Co., Cincinnati, Ohio

DRYING-OUT MACHINES
- Automatic
- Astle, H. J., Co., Providence, R. I.
- Baird Machine Co., The, Bridgeport, Conn.

DUST COLLECTING SYSTEMS
- Kirk & Blum Mfg. Co., Cincinnati, Ohio

DYNAMOS, LOW VOLTAGE, PLATING AND GALVANIZING
- Lasalco, Inc., St. Louis, Mo.
- L'Hommedieu, Charles F. & Sons, Inc., Chicago, Ill.

DYNAMOS, PLATING USED
- Baker, M. E., Co., The, Cambridge, Mass.
- Holland & Sons, Inc., Brooklyn, N. Y.

ELECTROLYTIC NICKEL FOR ALLOYING
- International Nickel Co., New York, N. Y.

ELECTRIC FURNACES
- Electric Furnace Co., Salem, Ohio

ELECTRO GALVANIZING EQUIPMENT AND SUPPLIES (See Dynamos; Plating Barrels; Tanks, Etc.)
- Lasalco, Inc., St. Louis, Mo.

ELECTRO PLATING EQUIPMENT AND SUPPLIES (See also Kind Wanted.)
- Beam-Knodel, Inc., New York
- Hanson-Van Winkle-Munning Co., Matawan, N. J.
- Lasalco, Inc., St. Louis, Mo.
- Chas. F. L'Hommedieu & Sons Co., Chicago, Ill.
- Matchless Metal Polish Co., Chicago, Ill., and Glen Ridge, N. J.
- Munning & Munning, Newark, N. J.
- National Sherardizing & Mach. Co., Hartford Conn.
- Stevens, Inc., Frederic B., Detroit, Mich.
- Udylite Co., The, Detroit, Mich.
- U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

ELECTROLYTIC COLOR PLATING
- United Chromium Inc., New York

ELECTRO PLATING JOB & CONTRACT
- see Polishing and Burnishing; Plating, Barrel Method.)
- Chromium Process Co., Shelton, Conn.
- National Sherardizing & Mach. Co., Hartford Conn.

ELECTRO PLATING TANKS
- American Hard Rubber Co., New York
- Beam-Knodel, Inc., New York
- Belke Mfg. Co., Chicago, Ill.
- General Ceramics Co., Inc., New York
- Hauser Stander Tank Co., Cincinnati, Ohio
- Lasalco, Inc., St. Louis, Mo.
- Stevens, Inc., Frederic B., Detroit, Mich.
- Storts Welding Co., Meriden, Conn.
- Udylite Co., The, Detroit, Mich.
- U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

ELECTROTYPING EQUIPMENT & SUPPLIES
- Hanson-Van Winkle-Munning Co., Matawan, N. J.

EMERY (Also see Abrasives.)
- Bias Buff & Wheel Co., Inc., The, Jersey City N. J.
- Hamilton Emery & Corundum Co., Chester, Mass.
- Chas. F. L'Hommedieu & Sons Co., Chicago, Ill.
- Matchless Metal Polish Co., Chicago, Ill., and Glen Ridge, N. J.

EMERY PASTE
- Bias Buff & Wheel Co., Inc., The, Jersey City N. J.
- Harrison & Co., Haverhill, Mass.
- Matchless Metal Polish Co., Chicago, Ill., and Glen Ridge, N. J.

ENAMELING FURNACES
- Electric Furnace Company, Salem, Ohio.

ENAMELING OVENS
- Kirk & Blum Mfg. Co., Cincinnati, Ohio

ENAMELS
- Colored
- Egyptian Lacquer Mfg. Co., New York, N. Y.
- Zapon Company, Stamford, Connecticut.
- Lacquer
- Egyptian Lacquer Mfg. Co., New York, N. Y.
- Zapon Company, Stamford, Connecticut.
- Wood
- Egyptian Lacquer Mfg. Co., New York, N. Y.
- Zapon Company, Stamford, Connecticut.

ENGINEERS
- Consulting Chemists
- International Chemical Co., Phila., Pa.
- Furnace
- Campbell, Hausfeld Co., Harrison, Ohio

EQUIPMENT
- Chromium Plating
- Lasalco, Inc., St. Louis, Mo.
- Chas. F. L'Hommedieu & Sons Co., Chicago, Ill.
- Stevens, Inc., Frederic B., Detroit, Mich.

FANS, EXHAUST & BLOWER
- Kirk & Blum Mfg. Co., Cincinnati, Ohio

FANS, DUST COLLECTING
- Kirk & Blum Mfg. Co., Cincinnati, Ohio

FELT POLISHING WHEELS
- Bacon Felt Co., Winchester, Mass.
- Chas. F. L'Hommedieu & Sons Co., Chicago, Ill.
- Hanson-Van Winkle-Munning Co., Matawan, N. J.

FIG CLEANERS (Also see Cleaning Compounds, Whale Oil Soap.)
- Magnus Chemical Co., Garwood, N. J.

FILTER SYSTEM FOR PLATING SOLUTIONS
- Belke Mfg. Co., Chicago, Ill.
- Industrial Filter & Pump Mfg. Co., Chicago, Ill.

FLUXES
- Brazing, Soldering, Tinning & Welding
- Krembs & Co., Chicago, Ill.

FORGING FURNACES
- Electric Furnace Company, Salem, Ohio.

FOUNDRY EQUIPMENT
- Stevens, Inc., Frederic B., Detroit, Mich.

FURNACES (See Annealing Furnaces; Burners; Melting Furnaces; Smelting Furnaces.)
- Campbell, Hausfeld Co., Harrison, Ohio
- Electric Furnace Co., Salem, Ohio

FUSE METAL
- Platt Bros. & Co., The, Waterbury, Conn.

GENERATOR BRUSHES
- Morganite Brush Co., Long Island City, N. Y.
- Speer Carbon Co., St. Marys, Pa.

GENERATORS (See Dynamos; Motor-Generator Sets.)
- Chas. F. L'Hommedieu & Sons Co., Chicago, Ill.

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Lasalco, Inc., St. Louis, Mo.
Munning & Munning, Newark, N. J.
Plating Products Co., Newark, N. J.
Udylite Co., The, Detroit, Mich.
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

GENERATORS-SPECIAL ATMOSPHERE
Electric Furnace Company, Salem, Ohio.

GENERATORS, Plating Used
Plating Products Co., Newark, N. J.

GLUE POTS
Vulcan Electric Co., Lynn, Mass.

GOLD CYANIDE
E. I. Du Pont de Nemours & Co., Inc., Electroplating Division, Wilmington, Del.

GOLD HYDRATE
E. I. Du Pont de Nemours & Co., Inc., Electroplating Division, Wilmington, Del.

GOLD PLATING SALTS
E. I. Du Pont de Nemours & Co., Inc., Electroplating Division, Wilmington, Del.

GREASELESS COMPOSITIONS
Lea Mfg. Co., The, Waterbury, Conn.
Matchless Metal Polish Co., Chicago, Ill., and Glen Ridge, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.

GRINDERS & BUFFERS
Electric
Acme Mfg. Co., Detroit, Mich.

GRINDING COMPOUNDS
International Chemical Co., Phila., Pa.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York, N. Y.

GRINDING MACHINES
Acme Mfg. Co., Detroit, Mich.

GRINDING WHEELS
The Carborundum Co., Niagara Falls, N. Y.

HARDENING FURNACES
Electric Furnace Company, Salem, Ohio.

HEAT RESISTING LACQUERS
E. I. Du Pont de Nemours & Co., Inc., Electroplating Division, Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York, N. Y.

HYDROGEN PEROXIDE
McGean Chemical Co., The, Cleveland, Ohio
E. I. Du Pont de Nemours & Co., Inc., Electroplating Division, Wilmington, Del.

JAPAN REMOVERS
Ford, J. B., & Co., Wyandotte, Mich.
International Chemical Co., Phila., Pa.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York, N. Y.

KILNS
Electric Furnace Company, Salem, Ohio.

KOTERAX COVERING & EQUIPMENT
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Co., The, Detroit, Mich.
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

LACQUER ENAMELS (See Enamels.)
Agate Lacquer Mfg. Co., Long Island City, N. Y.
Egyptian Lacquer Mfg. Co., New York, N. Y.
Maas & Waldstein Co., Newark, N. J.
Stanley Chemical Co., East Berlin, Conn.
H. V. Walker Co., Elizabeth, N. J.
Zapon Company, Stamford, Connecticut.

LACQUERS
Agate Lacquer Mfg. Co., Long Island City, N. Y.
Egyptian Lacquer Mfg. Co., New York, N. Y.
Maas & Waldstein Co., Newark, N. J.
Stanley Chemical Co., East Berlin, Conn.
H. V. Walker Co., Elizabeth, N. J.
Zapon Company, Stamford, Connecticut.
Colored
Agate Lacquer Mfg. Co., Long Island City, N. Y.
Egyptian Lacquer Mfg. Co., New York, N. Y.
Stanley Chemical Co., East Berlin, Conn.
Zapon Company, Stamford, Connecticut.
For Incandescent Lamps
Egyptian Lacquer Mfg. Co., New York, N. Y.
Zapon Company, Stamford, Connecticut.
Metal
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Egyptian Lacquer Mfg. Co., New York, N. Y.
Maas & Waldstein Co., Newark, N. J.
Stanley Chemical Co., East Berlin, Conn.
H. V. Walker Co., Elizabeth, N. J.
Zapon Company, Stamford, Connecticut.
Wood
Egyptian Lacquer Mfg. Co., New York, N. Y.
Stanley Chemical Co., East Berlin, Conn.
Zapon Company, Stamford, Connecticut.

LACQUER REMOVERS
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International Chemical Co., Phila., Pa.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York, N. Y.

LATHES (See also Polishing Lathes.)
Polishing
Acme Mfg. Co., Detroit, Mich.
Frederic B. Stevens, Inc., Detroit, Mich.

LININGS, FOR TANKS
Storts Welding Co., Meriden, Conn.

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International Chemical Co., Phila., Pa.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York

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Plating (Mechanical)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lasalco, Inc., St. Louis, Mo.

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Pit
Campbell, Hausfeld Co., Harrison, Ohio

METAL CLEANERS (See also Cleaning Compounds)
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International Chemical Co., Phila., Pa.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York
Pennsylvania Salt Co., Phila., Pa.
Philadelphia Quartz Co., Phila., Pa.
Udylite Co., The, Detroit, Mich.
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

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Matchless Metal Polish Co., Chicago, Ill., and Glen Ridge, N. J.
Siefen Co., J. J., Detroit, Mich.

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MONEL PICKLING BASKETS
International Nickel Co., New York, N. Y.
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NICKEL DETERMINATION APPARATUS
Paul Frank, New York

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Hanson-Van Winkle-Munning Co., Matawan, N. J.
McGean Chemical Co., The, Cleveland, Ohio

NICKEL SHOT
International Nickel Co., New York, N. Y.

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Seymour Mfg. Co., Seymour, Conn.

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NORMALIZING FURNACES
Electric Furnace Company, Salem, Ohio.

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OVENS—JAPANNING
Kirk & Blum Mfg. Co., Cincinnati, Ohio

OVENS—INDUSTRIAL
Kirk & Blum Mfg. Co., Cincinnati, Ohio

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Krembs & Co., Chicago, Ill.
Sulphur Products Co., Greensburg, Pa.

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Kirk & Blum Mfg. Co., Cincinnati, Ohio

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pH PAPERS
Lea Mfg. Co., The, Waterbury, Conn.
Paul Frank, N. Y.
Udylite Corp., Detroit, Mich.

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International Nickel Co., New York, N. Y.
Kirk & Blum Mfg. Co., Cincinnati, Ohio

PICKLING TANKS
International Nickel Co., New York, N. Y.
Kirk & Blum Mfg. Co., Cincinnati, Ohio
Paramount Rubber Service, Inc., Detroit, Mich.
Storts Welding Co., Meriden, Conn.

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International Nickel Co., New York, N. Y.

PIPING AND FITTINGS, SHEET METAL
Kirk & Blum Mfg. Co., Cincinnati, Ohio

PLATED AND POLISHED SHEET METALS (See also Sheets.)
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Mutual Chemical Co. of America, New York, N. Y

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Lasalco, Inc., St. Louis, Mo.
Lea Mfg. Co., The, Waterbury, Conn.
Frederic B. Stevens, Inc., Detroit, Mich.
Udylite Co., The, Detroit, Mich.
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

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Hanson-Van Winkle-Munning Co., Matawan, N. J
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

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L'Hommedieu, Charles F. & Sons, Inc., Chicago, Ill.
Munning & Munning, Newark, N. J.
National Sherardizing & Mach. Co., Hartford Conn.
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Udylite Co., The, Detroit, Mich.
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Udylite Co., The, Detroit, Mich.
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

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Hauser Stander Tank Co., Cincinnati, Ohio
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McAleer Mfg. Co., Detroit, Mich.
Munning & Munning, Newark, N. J.
Oriental Rouge Co., Bridgeport, Conn.
Puritan Mfg. Co., Waterbury, Conn.
Udylite Co., The, Detroit, Mich.
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

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Mac Farland Mfg. Co. Inc., Long Island City, N. Y.
McAleer Mfg. Co., Detroit, Mich.
Plating Products Co., Newark, N. J.
Puritan Mfg. Co., Waterbury, Conn.
Udylite Co., The, Detroit, Mich.
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.
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McAleer Mfg. Co., Detroit, Mich.
Munning & Munning, Newark, N. J.
Oriental Rouge Co., Bridgeport, Conn.
Puritan Mfg. Co., Waterbury, Conn

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American Nickeloid Co., Peru, Ill.

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Baird Machine Co., The, Bridgeport, Conn.
Power, All Types
Baird Machine Co., The, Bridgeport, Conn.

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Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York

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RUST REMOVERS
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Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York

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Industrial Filter & Pump Mfg. Co., Chicago, Ill

SAND BLASTS (Inquire)
Cabinet
Astle, H. J., Co., Providence, R. I.

SCALE-FREE HARDENING FURNACES
Electric Furnace Company, Salem, Ohio.

SCRAP
Metallrugical Products Co., Inc., Phila., Pa.

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Seymour Mfg. Co., Seymour, Conn.
Nickel
International Nickel Co., New York, N. Y.
Seymour Mfg. Co., Seymour, Conn.
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American Nickeloid Co., Peru, Ill.

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Kirk & Blum Mfg. Co., Cincinnati, Ohio

SHERARDIZING
National Sherardizing & Mach. Co., Hartford Conn.

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SILVER PLATING SALTS
E. I. Du Pont de Nemours & Co., Inc Electroplating Division, Wilmington, Del.

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McGean Chemical Co., The, Cleveland, Ohio

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E. I. Du Pont de Nemours & Co., Inc., Electroplating Division, Wilmington, Del.
Vulcan Detinning Company, Sewaren, N. J.

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Belke Mfg. Co., Chicago, Ill.
Industrial Filter & Pump Mfg. Co., Chicago

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International Chemical Co., Phila., Pa.

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Day Mfg. Co., S. A., Buffalo, N. Y.

STAMPING AND DRAWING
American Nickeloid Co., Peru, Ill.

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E. I. Du Pont de Nemours & Co., Inc., Electroplating Division, Wilmington, Del.
Vulcan Detinning Co., The, Sewaren, N. J.

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Abbott Ball Co., The, Hartford, Conn.
Baird Machine Co., The, Bridgeport, Conn.
Hartford Steel Ball Co., Hartford, Conn.

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General Ceramics Co., New York, N. Y.
Hanson-Van Winkle-Munning Co., Matawan, N. J
Hauser Stander Tank Co., Cincinnati, Ohio
Paramount Rubber Service, Inc., Detroit, Mich.
Storts Welding Co., Meriden, Conn.
Udylite Co., The, Detroit, Mich.
U. S. Stoneware Co., New York
U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.
Monel Metal
International Nickel Co., New York, N. Y.
Kirk & Blum Mfg. Co., Cincinnati, Ohio
Rubber
Paramount Rubber Service, Inc., Detroit, Mich.
Stoneware
General Ceramics Co., New York, N. Y.
U. S. Stoneware Co., New York

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Kocour Co., Chicago, Ill.

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International Nickel Co., New York, N. Y.

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Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lea Mfg. Co., The, Waterbury, Conn.

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Magnuson Products Corp., Brooklyn, N. Y.
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Baird Machine Co., The, Bridgeport, Conn.
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Hartford Steel Ball Co., Hartford, Conn.
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U. S. Galvanizing & Plating Equip. Corp., Brooklyn, N. Y.

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